U.S. DEPARTMENT OF COMMERCE
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PB-262 921

Air Pollution Abstracts 53381-54115. Volume 7 Number 1, January 1976

Environmental Protection Agency, Research Triangle Park, N C

Jan 76

PB 262 921

Volume 7, No. 1
January 1976
CODEN:APABCA 7(1)1976
ISSN:0027-5956

AIR POLLUTION ABSTRACTS

53381-54115

January 1976

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

REPRODUCED BY
NATIONAL TECHNICAL
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TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
APABCA- 7-1-1976

2.

3. RECIPIENT'S ACCESSION NO.

4. TITLE AND SUBTITLE
Air Pollution Abstracts Volume 7, No. 1

5. REPORT DATE
January 1976

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Air Pollution Technical Information Center
Research Triangle Park, North Carolina 27711

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
Same

13. TYPE OF REPORT AND PERIOD COVERED

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 53381 - 54115.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Abstracts Information retrieval		13B 5B

18. DISTRIBUTION STATEMENT
Unlimited

19. SECURITY CLASS *(This Report)*

20. SECURITY CLASS *(This page)*

21. NO. OF PAGES
163

22. PRICE
6.75

EPA Form 2220-1 (9-73)

AIR POLLUTION ABSTRACTS

VOLUME 7, NO. 1 JANUARY 1976

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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The Administrator of the Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 31, 1975.

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

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Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

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Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

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Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

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RECENT CONTRACT AWARDS

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Contract No. 68-02-1378, Task Order No. 23 .... *$43,000*
REVIEW, COLLECT AND UPDATE AN EMISSION INVENTORY IN SUPPORT OF AIR QUALITY MAINTENANCE PLAN DEVELOPMENT IN OKLAHOMA.
Pacific Environmental Services, Inc., 1930 14th Street, Santa Monica, California 90404

Contract No. 68-02-1376, Task Order No. 20 .... *$27,221*
INSTALLATION AND BRINGING ON LINE EMISSION INVENTORY SYSTEM/PERMIT AND REGISTRATION SUBSYSTEM (EIS/P&R) OF THE COMPREHENSIVE DATA HANDLING SYSTEM (CDHS) FOR THE STATE OF ARIZONA.
GCA Technology Division, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-2318, RFP No. Du-75-C190 .... *$59,492*
PREPARE REPORTS ON EMISSIONS AND AIR QUALITY TRENDS TO ASSIST IN DEVELOPING MONITORING NETWORK DESIGN CRITERIA AND GUIDELINE DOCUMENTS.
Technology Service Corp., 2811 Wilshire Blvd., Santa Monica, California 90403 (NOTE: Contract contains options in the amount of $63,472)

Contract No. 68-02-2144, RFP No. Du-75-A143 .... *$616,041*
FIELD TESTING-APPLICATION OF IMPROVED COMBUSTION TECHNOLOGY TO INDUSTRIAL COMBUSTION EQUIPMENT.
KVB, Inc., 17332 Irvine Blvd., Tustin, California 92680

Contract No. 68-02-2149, RFP No. Du-76-A052 .... *$40,150*
PROFESSIONAL SERVICES IN ASSESSING NEW EMERGING CONTROL TECHNOLOGIES.
Paul W. Spaite, 6315 Grand Vista Avenue, Cincinnati, Ohio 45213 (NOTE: Contract contains options in the amount of $34,500)

Contract No. 68-02-2343, RFP No. Du-76-C093 .... *$76,149*
MODIFICATION TO LABORATORY J-216, ENVIRONMENTAL RESEARCH CENTER, RESEARCH TRIANGLE PARK, NORTH CAROLINA.
L. A. Downey & Sons, Inc., P. O. Box 1688, Durham, North Carolina 27702

Contract No. 68-02-2331, RFP No. Du-76-C053 .... *$53,922*
A STUDY OF SULFUR DIOXIDE IN THE VICINITY OF THE CROWE, RIVERSIDE, AND WAGNER POWER STATIONS METROPOLITAN AREA.
Geomet, Inc., 15 Firstfield Road, Gaithersburg, Maryland 20760

Contract No. 68-02-2138, RFP No. Du-75-A138 .... *$2,007,661*
ENVIRONMENTAL ASSESSMENT/SYSTEMS ANALYSIS AND PROGRAM SUPPORT FOR FLUIDIZED]BED COMBUSTION.
Battelle Memorial Institute, Columbus Laboratory, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-1944, RFP No. Du-75-B245 .... *$314,497*
STUDY TO DETERMINE EFFECT OF INTERACTION OF OXIDANT AND SULFATE ON PRODUCTION OF LUNG LESIONS.
Stanford Research Institute, Menio Park, California 94025

Contract No. 68-02-2345, RFP No. Du-75C408 .... *$185,075*
PERFORM A PARTICULATE STUDY FOR THE PHILADELPHIA METROPOLITAN INTERSTATE AIR QUALITY CONTROL REGION.
GCA Technology Division, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-2339, RFP No. Du-75-C225 .... *$106,000*
DESIGN, DEVELOP AND PREPARE AIR POLLUTION CONTROL TRAINING MATERIALS CONSISTING OF AND INCLUDING THREE SEPARATE TASKS.
National Loss Control Service Corp., Long Grove, Illinois 60049

Contract No. 68-01-2787, Amendment No. 7 .... *$81,600*
ADDITIONAL OPERATIONAL SUPPORT FOR THE UNIVAC 1110 COMPUTER AT RESEARCH TRIANGLE PARK, NORTH CAROLINA.
Integrated Systems Support, Inc., 7929 West Park Drive, McLean, Virginia 22101

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1975

53381 **APTIC NO. 77649**

Amr, A. T., P. W. Purdom, H. L. Brown, R. E. Laessig, and B. B. Hamel

EVALUATION AND ASSESSMENT OF FOSSIL AND NUCLEAR FUEL SYSTEMS ON THE BASI OF ENVIRONMENTAL QUALITY, FUEL CYCLE EFFICIENCIES AND ECONOMICS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-08.8.)*

A procedure for quantifying the efficiencies, environmental qualities, and economics of fuel systems for electrical power generation is described, and statistical inferences regarding fuel system selection on a national basis are presented. Coal is the optimal fuel system in terms of efficiency alone, whereas natural gas is the choice in terms of environmental impact. Uranium is the optimal fuel system in terms of efficiency, environmental impact and economics considered together. Air quality impact ratings are tabulated for each of the above fuel systems. (Author conclusions modified)

53382 **APTIC NO. 77667**

Anderson, Michael K.

POWER PLANT IMPACT ON AMBIENT AIR: COAL VS. OIL COMBUSTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-33.5.)*

Total suspended particulates, sulfur oxides, and nitrogen oxides were monitored for specific wind conditions in the vicinity of a steam electric power plant over a 1-month period to determine the effect of coal-firing versus oil-firing on ambient pollutant levels. Air pollution levels were significantly lower during oil firing than during coal firing. Monitoring data obtained downwind of the plant over a 24-hour period revealed a 37% reduction in NOx, a 90% reduction in SOx, and a 30% reduction in total suspended particulate levels when oil was consumed in place of coal. The best method for comparing 24-hour pollutant samples to hourly wind direction readings involved establishing correlations between the pollutant concentrations and the number of hours that the wind blew across the source to the site. Maximum potential impact calculations suggested that primary and secondary 24-hour SO2 standards are in danger of being exceeded if coal is burned at the plant. The prevention of this requires keying period of coal combustion to suitable meteorological conditions or operation of the plant at less than full coal combustion capacity. (Author abstract modified)

53383 **APTIC NO. 77807**

Candeli, A., G. Morzozzi, A. Paolacci, and L. Zoccolillo

ANALYSIS USING THIN LAYER AND GAS-LIQUID CHROMATOGRAPHY OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE EXHAUST PRODUCTS FROM A EUROPEAN CAR RUNNING ON FUELS CONTAINING A RANGE OF CONCENTRATIONS OF THESE HYDROCARBONS. *Atmos. Environ., 9(9):843-849, Sept. 1975. 25 refs.*

The PAH content of four unleaded fuels at constant level of aromatics (48%) but with increasing concentration of aromatic hydrocarbons with 9-10+ carbon atoms (0%, 1%, 15%, 46%) is related to the PAH content of the exhaust products when burned in a European car. The simplified and rapid analytical analysis of fuels and exhaust products involves partition between solvents, thin layer chromatography and gas-liquid chromatography. The amount of PAH in the fuels tested increases with an increase in the concentration of aromatic hydrocarbons with 9-10+ carbon atoms. The PAH content of the exhaust gases increases with increasing content of PAH in the respective fuels, but it was not possible to ascertain whether the PAH content of the fuels or the 9-10+ carbon atom and higher aromatic hydrocarbons content was the more important factor. (Author abstract modified)

53384 **APTIC NO. 77700**

Cowherd, Chatten, Jr., James H. Southerland, and Charles O. Mann

METHODOLOGY FOR A NATIONAL EMISSIONS INVENTORY OF FUGITIVE DUST SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 17 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-36.5.)*

The methodology used to compile data for a national emissions inventory of fugitive dust emissions (unpaved roads, construction sites, agricultural land tilling, and unpaved air strips) is described. Data on the extent of each source category and on the correction parameters which adjust emissions estimates for variations in texture (silt content) and average moisture content of the emitting surface were compiled for each of more than 3000 counties in the United States. Calculation schemes ranged from the apportioning of state-wide measures of source extent to the analysis of geographical maps of climatic and soil properties. The tabulations are being entered into the National Emissions Data System for computation of a national fugitive dust emissions inventory. Average values of corrected emission factors are presented for each state. Estimates of the possible error in the calculated data range from + or - 15% to + or - 50%. (Author abstract modified)

53385 **APTIC NO. 75944**

Ctvrtnicek, T. E., S. J. Rusek, and C. W. Sandy

EVALUATION OF LOW-SULFUR WESTERN COAL CHARACTERISTICS, UTILIZATION, AND COMBUSTION EXPERIENCE (FINAL REPORT). *Monsanto Research Corp., Dayton, Ohio, Dayton Lab., Environmental Protection Agency Contract 68-02-1320, Program Element 1AB013, ROAP 21BBZ-008, Task 12, Rept. EPA-650/2-75-046, MRC-DA-467, 569p., May 1975. 104 refs.*

NTIS: PB 243911/AS

Detailed information and statistics on western coal resources, mining, production, composition, and combustion properties are presented. Over 43% of some 200 billion tons of demonstrated coal reserves in the western states is surface minable. Approximately 80% of sub-bituminous coal reserves and 91% of lignite reserves in the western states contain less than 1% sulfur. During the firing of western coal, a decline in the collection efficiency of electrostatic precipitators occurs as a

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result of western coal s low sulfur content and subsequent high fly ash resistivity. There is insufficient information to assess the effect of coal trace element composition on the environment. Low-sulfur western coal burning plants in the small and intermediate boiler size range generally meet the Federal sulfur dioxide regulation (1.2 lb SO2/million Btu). The best market potential for western coal based on local rail coal transportation is the northeast central and northwest central regions.

53386 **APTIC NO. 77664**

Ensor, D. S., T. A. Cahill, and L. E. Sparks

ELEMENTAL ANALYSIS OF FLY ASH FROM COMBUSTION OF A LOW SULFUR COAL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-33.7.)*

Elemental composition as a function of particle diameter was determined for fly ash resulting from the combustion of low sulfur coal. A cascade impactor with a back-up filter was used to collect fly ash samples at the inlet and outlet of a fluidized bed scrubber, and the particulate matter collected was analyzed by an ion-excited X-ray technique. An enrichment of sulfur, copper, and zinc was noted at the scrubber inlet. This enrichment was possibly due to evaporation of volatile elements during combustion followed by condensation on more inert materials when the stack gases cooled. The three same elements were also enriched at the scrubber outlet. The increase in S was possibly a partial result of gas to particle conversion within the scrubber. An enrichment of the scrubber exhaust as a function of particle size was possibly due to the entrainment of mist containing soluble elements. The enrichment of the soluble elements potassium, calcium, manganese, nickel, copper, and zinc relative to silicon (the standard) for both large and small particles was unexpected. A possible explanation for this enrichment involved the bubble mechanism of the fluidized bed scrubber which was packed with plastic balls.

53387 **APTIC NO. 77707**

Fife, James A.

CONTROL OF ATMOSPHERIC EMISSIONS FROM SOLID WASTE PYROLYSIS SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.5.)*

The use of pyrolysis for solid waste disposal is discussed along with various types of commercial devices in different stages of development. Emissions from pyrolysis systems are significantly lower than those from conventional incineration systems due to the air deficiency of the former, particularly underfire air deficiency. Particulate emissions from various commercial units being developed and tested vary from 0.02-0.05 grains/standard dry cu ft. The potential for nitrogen oxide formation is also lower with pyrolysis systems since they generally are operated at lower temperatures and with a smaller availability of nitrogen in the combustion air.

53388 **APTIC NO. 77961**

Gilliam, Clarence W. and John E. Tanner, Jr.

FLARE, IGNITER AND PYROTECHNIC DISPOSAL: RED PHOSPHORUS SMOKES (FINAL REPORT). *Naval Ammunition Depot, Crane, Ind., Applied Sciences Dept., Naval Sea Systems Command Work Request N00024-75-WR-52226, Proj. 63721X1, RDTR Rept. 298, 26p., May 1975. 10 refs.*

Possible methods of disposal for red phosphorus smoke devices were studied. They include total digestion, acid extraction, differential settling, sublimation, and incineration. Total digestion methods yielded a solution which, when neutralized with ammonium hydroxide, was found to rank favorably with commercial nitrogen phosphorus fertilizers. Extraction of the metals from hot hydrochloric acid or with a mixture of sulfuric and oxalic acids allowed the recovery of 90% of the red phosphorus in elemental form at 90% to 95% purity. The differential settling rate method gave insufficient separation by itself, though it could be useful as part of a total process. The experiments to sublime the red phosphorus directly from the composition were unsuccessful because of the formation of white phosphorus. Up to 40% of the phosphorus from the pyrotechnic composition was recovered as phosphorus pentoxide in the incineration tests; the balance remained in the residue as a mixture of phosphorus pentoxide and metal phosphates. The latter were difficult to remove even under the most stringent of conditions. Total digestion, extraction with sulfuric and oxalic acids, and incineration were analyzed on a cost effectiveness basis. The incineration method was the most desirable because the operational cost of this method is estimated to be less than the other two methods. (Author abstract modified)

53389 **APTIC NO. 77727**

Harwood, Colin F. and David K. Oestreich

THE EMISSION OF ASBESTOS PARTICLES FROM OPEN SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1975. 20 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-36.1.)*

Open sources of asbestos emissions were investigated, with particular reference to waste dumps. Ambient air samples were collected on 0.8 micron membrane filters at dumps at an asbestos ore mill, a cement pipe plant, and a general asbestos products plant. The number of fibers with a length of 1.5-30 micron, as counted by an optical microscope, ranged from 100-1,000,000 fibers/cu m at distances of less than 1 km from the dumps. The number of fibers with a length of 0.05-1.5 micron, as counted by an electron microscope, ranged from 10 million to 1 billion fibers/cu m. Little or nothing was being done to control the asbestos emissions at the dumps. Possible control methods for such sources are discussed. (Author abstract modified)

53390 **APTIC NO. 78257**

Hatakeyama, T.

PREDICTING NITRIC OXIDE FORMATION IN DIRECT-INJECTION DIESEL ENGINES. *(Chokusetsu funsha shiki kiizeru kikan no NO seisei ni kansuru ichi kosatsu). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 12(3):342-347, 1975. 8 refs.*

A simple mathematical model for nitric oxide formation in direct-injection diesel engines was developed, in which the combustion gas in the cylinder was divided into two regions, burned and unburned gases, and the excess air rate in the burned gas region were considered to be functions of combustion rate and engine operating parameters. The formation rate of NO calculated by model simulation was in good agreement with experimental results over a wide range of normal engine operating conditions (load, revolution and fuel injection timing). The NO control measures by the modification of combustion mode (configuration of heat release rate) resulted in the deterioration of engine power output, and a correlation was found between NO emission rate and fuel consumption rate, regardless of the configuration of the heat release rate. The NO formation under specific conditions such as exhaust gas recirculation and water injection was qualitatively analyzed, and the effects of ignition timing, heat release period, centroide position of heat release rate on engine performance and NO emission rate were also evaluated.

53391 ***APTIC NO. 78066***

Huntzicker, James J., Sheldon K. Friedlander, and Cliff I. Davidson

MATERIAL BALANCE FOR AUTOMOBILE-EMITTED LEAD IN LOS ANGELES BASIN. Environ. Sci. Technol., 9(5):448t457, May 1975. 60 refs.

A material balance for automobile-emitted lead in the Los Angeles Basin was estimated from measurements of particle size distributions, atmospheric concentrations, and surface deposition of lead at various sites around the basin. Approximately 24 metric tons/day of lead as gasoline antiknock additives are consumed, and about 18 tons/day of this are exhausted to the atmosphere. About 6 tons/day are retained in automobiles. About two-thirds of the exhausted lead is deposited over the land area of the basin, and one-third is advected out of the basin. The lead blown out of the Los Angeles area is the major source of atmospheric lead for regions immediately downwind. Automobile-emitted lead also accounts for more than half of the anthropogenic lead input to the Los Angeles coastal waters. (Author abstract modified)

53392 **APTIC NO. 77948**

Israel, Gerhard W. and James S. Whang

REAL TIME CHARACTERIZATION OF PARTICULATE EMISSIONS FROM MAJOR SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-28.7.)*

Particulate emissions from motor vehicles and a coal fired power plant within the vicinity of the sources with high temporal resolutions were compared with ambient particulate levels. Simultaneous measurements of Aitken nuclei concentrations (CNC), light scattering coeffient (BS), mass concentrations (MC), carbon monoxide concentrations, nitrogen oxide concentrations, and traffic volume were carried out in the Baltimore Harbor Tunnel. Simultaneous measurements of CNC, BS, MC, and sulfur dioxide concentrations were made in the plume of a 355 Mw(e) pulverized coal fired power plant on the ground and aloft. Similar measurements were made for extended periods in the ambient atmosphere in a northern suburb of Washington, D. C. Power plant emissions significantly increase the ground level concentration of suspended particulates, condensation nuclei, and SO2, while remaining invisible. Sedimentation reduces the coarse particulates from a power plant by as much as 30% within the first 6 km of the stack. There is excellent correlation among CNC, BS, and SO2 concentrations in power plant emissions.

53393 **APTIC NO. 77929**

Jacko, Robert B. and James P. Loop

A PARAMETRIC STUDY OF AN OPEN HEARTH FURNACE PARTICULATE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-15.2.)*

Operating parameters affecting particulate emissions from a typical basic open hearth steel making furnace were studied. Consecutive 15-minute emission samples were extracted from the furnace gathering flue with a modified Andersen sampling head and the standard Environmental Protection Agency train. This resulted in the characterization of emissions with process time. The major process parameters that were varied during the study were the percentages of hot metal, number two dealer scrap, and oxygen lancing. Overall emissions varied by as much as 10 to 1 during a typical 8-hour heat. Maximum oxygen usage resulted in maximum particulate emissions; and the lowest oxygen usage resulted in minimum emissions, with the minimum occurring typically for 50% hot metal addition levels. The amount of dealer scrap charged with each of the hot metal additions exerted a smaller effect on the overall emissions as compared to the use of oxygen. Doubling the amount of oxygen resulted in a doubling of the particulate emission level, while only a 30% increase was observed over the full range of number two dealer scrap. The median particle diameter of emissions sampled during each of seven heats was 1.5 micron. (Author abstract modified)

53394 **APTIC NO. 77802**

Joshi, Satish and Hans-Urs Wanner

EMISSIONS FROM COMBUSTION OF INDOOR DUST. *(Emissionen bei der Versengung von Raumluftstaub). Text in German. Zentralbl. Bakteriol. Hyg., Infektionskr. Abt. Orig. B., 160(4-5):499-508, 1975. 6 refs.*

Physico-chemical changes caused by heating indoor dust in a model apparatus were investigated. Four dust samples of different origins were heated at 3 temperatures (200, 400, 600 C) for three residence times (5, 15, 30 min). The higher the temperature, the greater the weight loss expressed as a percentage (15-75%). The residence time had no effect on the loss. Three dust samples showed a pH of 7 before heating, while the fourth showed a pH of 10. After heating to 200 C, the pH of one of the samples rose from 7 to 10. When heated to 400 and 600 C, all the samples showed pH values between 10 and 11. The residence time had no effect. The pH of the gaseous reaction products did not show a uniform pattern at 200 C. At 400 C, the pH was between 7.5 and 8.5, while at 600 C no further change was observed. Changes in pH occurred during the first 15 min. Dust samples, when heated, emit carbon monoxide, carbon dioxide, nitrogen oxides, and ammonia, according to chemical analysis.

53395 **APTIC NO. 77703**

Kaplan, Lawrence and Pete[illegible]nconeri

DETERMINATION AND EVALUATION OF STACK EMISSIONS FROM MUNICIPAL INCINERATORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.1.)*

Performance and stack emissions tests were performed on three large capacity municipal incinerators in New York City. The tests were performed on two electrostatic precipitators and one scrubber serving the incinerators. The gaseous and particulate components leading into the control devices were considerably lower than accepted incinerator furnace emission factors. The electrostatic precipitators, when adequately designed, met the present particulate emission regulations for municipal incinerators with an adequate safety margin for possible future stricter laws. Precipitators downstream of spray towers appeared capable of meeting future laws covering gaseous emissions from incinerators. Either up-flow or down-flow gas spray towers worked satisfactorily with precipitators to meet required efficiencies. However, the down-flow towers removed a larger amount of gaseous pollutants. Electrostatic precipitators limited emissions to an average of approximately 7 lb of particulate/hr. Electrostatic precipitators also averaged 33% sulfur dioxide removal, 75% hydrochloric acid fume removal, 60% chloride removal, and 23% removal for organic gases. Gas sampling results are also reported ammonia, aldehydes, organic acids, ozone, nitrogen dioxide, hydrocarbons, carbon monoxide, and nitric oxide.

53396 **APTIC NO. 78108**

Karnofski, Michael A.

ODOR GENERATION IN THE KRAFT PROCESS. *J. Chem. Educ., 52(8):490-492, Aug. 1975. 7 refs.*

The kraft process itself is described. Major sources of odor are the digesters, multiple-effect evaporator, and the recovery furnace. Odor formation in each of these sources is discussed, including the specific odorous chemicals. Much of the odorous gas produced during the kraft process can be treated to remove the offensive smell before it enters the atmosphere.

The condensible gases released by the digesters and evaporator are steam or air stripped to remove odorous gases. The steam or air, now containing the odorous gases, is combusted after condensing and refluxing the water. A properly run recovery furnace should release little or no odor.

53397 **APTIC NO. 77793**

Katou, Tatsuo and Ryozo Nakagawa

DETERMINATION OF ALKYL LEADS BY COMBINED SYSTEM OF GAS CHROMATOGRAPHY AND ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Gasu kuromato gurafi - genshi kyuko setsuzoku hoshiki ni yoru arukiru namari no bunseki). Text in Japanese. Yokohama Kokuritsu Daigaku Kankyo Kagaku Senta Kiyo (Bull. Inst. Environ. Sci. Technol., Yokohama Natl. Univ.), 1(1):19-24, 1975. 6 refs.*

The determination of lead alkyls by a gas chromatography-atomic absorption spectrometry combination is described. The atomic absorption spectrometer is used as the detector for lead compounds eluted from the chromatograph column. A 5-centimeter slot burner is connected to the end of the column by a teflon tube. An air-acetylene flame (flow rates of 6.2 l/min and 1.2 l/min) is used. Alkyl leads tested include: tetraethyl lead, trimethyl ethyl lead, dimethyl diethyl lead, methyl triethyl lead, and tetramethyl lead; they are eluted in that order from a 3-meter column of 25 wt% TCP-Chromosorb WAW. Their complete separation is achieved at a column temperature of 110 C with a helium flow rate of 40 ml/min. The half width of the GC peaks is independent of the lead concentration as long as a constant carrier flow is maintained, and the peak area corresponds to the absolute amount of lead in the gas. The light absorbance corresponds to the lead concentration of the gas. A linear calibration curve is obtained up to 5 ppm lead. The technique is used to determine the alkyl lead compounds in gasolines (diluted by 1000 with methyl isobutyl ketone). The greatest advantage of the technique for gasoline analysis is that only one lead calibration curve is necessary to determine all lead alkyls in gasoline.

53398 **APTIC NO. 77805**

Katzman, H. and W. F. Libby

HYDROCARBON EMISSIONS FROM JET ENGINES OPERATED AT SIMULATED HIGH-ALTITUDE SUPERSONIC FLIGHT CONDITIONS. *Atmos. Environ., 9(9):839-842, Sept. 1975. 7 refs.*

The hydrocarbon content of the exhaust of two different turbojet engines operated at simulated supersonic flight conditions was determined using gas-liquid chromatography. The samples were concentrated in order to measure individual components down to about 10 ppb carbon (0.01 ppmc). More than 70 hydrocarbon species in the C1 - C13 range were found to be present in the exhaust. Although the jet fuel that was burned contained 86% paraffins, olefins constituted up to 75% of the hydrocarbons found in the exhaust. (Author abstract modified)

53399 **APTIC NO. 77661**

Kilgroe, James D., Larry J. Shannon, and Maurice P. Schrag

EMISSIONS FROM THE SUSPENSION FIRING OF MUNICIPAL SOLID WASTE AND PULVERIZED COAL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.7.)*

Field tests by the Union Electric Company and the Environmental Protection Agency involving the use of municipal solid waste as an auxiliary fuel in coal-fired utility boilers were conducted to determine the effects of solid waste firing on electrostatic precipitator performance and air pollutant emissions. The Union Electric tests indicated significant precipitator particulate collection efficiency losses when municipal solid waste was fired. There were no differences in precipitator collection efficiency during the EPA tests. Performance losses during the Union Electric tests resulted from increased combustion gas flow rates, modified particle properties, and possible non-optimum precipitator electrical settings. The failure of the EPA tests to show precipitator performance changes were possibly the result of non-representative precipitator performance during the coal tests caused by previous solid waste firing operations. Additional tests are required to quantify precipitator performance losses resulting from municipal solid waste firing. (Author abstract modified)

53400 **APTIC NO. 77993**

King, William R. and James K. Ferrell

FLUORINE EMISSIONS FROM WET PROCESS PHOSPHORIC ACID PLANT PROCESS WATER PONDS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-25.7.)*

Emission estimates for the release of volatile fluorine compounds from process water ponds at phosphate fertilizer plants were developed from the pond-to-air mass transfer coefficient and the vapor pressure of fluorine over pond water. The estimates were compared with measurements of ambient fluorine compound concentrations downwind of process water ponds and the estimates were found to be valid. Emissions from the ponds ranged from 0.7 to 10 lb/acre/day. The emission rate depended on pond temperature, fluorine content of the pond water, and wind speed. (Author abstract modified)

53401 **APTIC NO. 77672**

Kleiner, Beth C. and John D. Spengler

CARBON MONOXIDE EXPOSURES TO BOSTON BICYCLISTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-31.4.)*

A bicycle instrumented to continuously record carbon monoxide concentrations with a portable Ecolyzer was ridden during the summer of 1974 over 200 miles of metropolitan Boston streets. The CO levels vary with street configuration, traffic proximity of recorder to roadway, and with the meteorological conditions. During morning and evening rush hours, CO levels exceed 25 ppm near intersections and in a few instances are in excess of 50 ppm. The mean value for all trips is 12.6 ppm. The CO ranges encountered by cyclists on main thoroughfares did not exceed Environmental Protection Agency standards. There are significant measured differences in CO levels for alternative routes between the same end points. (Author abstract modified)

53402 **APTIC NO. 78252**

Kohata, Shoichi

ASSEMBLED SMOKESTACK. *(Shusoku entotsu). Text in Japanese. (Shikawajima-Harima Heavy Industrial Co., Ltd. Tokyo (Japan)) Japan. Pat. Sho 5-22732. 4p., Aug. 1, 1975. 2 refs. (Appl. Feb. 4, 1971, 1 claim).*

The smokestack structure for accommodating emission gases from several smoke sources without having an individual smokestack is described. The smokestack was subdivided by hollow walls from top to bottom, and each division is connected to a single smoke source through a duct. The bottom end of the hollow wall is open so that outside air can be sucked in and drafted up. The draft increases the velocity of the emission gas from the top of the smokestack. Since each subdivision is connected to a single smoke source, the velocity of emission gas from the top of the smoke stack is not affected. If the cooling effect of the hollow wall by drafting air is not effective, the use of a spacer within the hollow space of the wall can be used to increase the speed of the drafting air.

53403 **APTIC NO. 78313**

Koshi, Masaki, Izumi Ohkura, and Yasuo Ibaragi

AN EXPERIMENTAL STUDY ON THE EFFECT OF TRAFFIC CONTROL ON MOTOR VEHICLE EMISSIONS. *(Jidosha haishutsu gasu ni oyobosu kotsu seigyo no eikyo ni tsuite). Text in Japanese. Domoku Gakkai Ronbun Hokokushu (Proc. Japan Soc. Civil Eng.), no. 240:71-79, Aug. 1975. 10 refs.*

Effect of traffic patterns on automotive exhaust gas emissions was studied. Actual traffic patterns were obtained by running cars under various road and time conditions. From these 510 patterns, 64 representative patterns were selected. Chassis dynamometer tests were conducted on 8 representative gasoline and LPG (liquefied petroleum gas) cars, to measure exhaust gas emissions on the basis of these patterns, and by the standard 10-mode test. For diesel trucks, engine bench tests were conducted on the basis of driving conditions obtained from actual survey. In chassis dynamometer tests, exhaust gas emissions were measured by the CVS constant volume sampling) method. Three types of roads included in the study were arterial roads, back streets, and metropolitan high-speed highways. Arterial roads exhibited normal traffic conditions and abnormal traffic conditions (late night and early morning, when vehicles moved at high speeds). Over 100 measurements were made on amounts of emissions vs. various traffic conditions. Linear relationships were found between travel time and emissions of carbon monoxide, hydrocarbons fuel consumption. By shortening travel time, emissions should be reduced. On the other hand, high-speed driving, although shortening travel time, results in increased fuel consumption and emissions. Some dependency was found between nitrogen oxides emission amounts and acceleration-deceleration fluctuations. Data on diesellengines were inconclusive, but the proportion of NOx emitted by diesel engines is thought to be quite high, when NOx emissions from all vehicles are considered. Graphs, tables, equations are included.

53404 **APTIC NO. 77706**

Lewis, F. Michael

FUNDAMENTALS OF PYROLYSIS PROCESSES FOR RESOURCE RECOVERY AND POLLUTION CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.4.)*

The fundamentals of pyrolysis processes are discussed in relation to solid waste disposal. Pyrolysis not only reduces the mass, bulk, and putrescibility of solid waste but also offers potential for increased resource recovery and decreased air pollution. When combustion is completed in a separate combustion chamber at low excess air rates, process efficiency in terms of steam production at minimum flue gas volume is maximized, and the size of air pollution abatement equipment is reduced. Char-producing pyrolysis systems reduce emissions of particulates that remain chemically bound to the char, though further research is required to quantify this aspect of air pollution reduction. The recirculation of flue gas to the underfire air system of a conventional incinerator is an application of the principles of pyrolysis and gasification that offers promise in reducing particulate emissions and thermal damage to grates. (Author conclusions modified)

53405 **APTIC NO. 78387**

Lukasiewicz, R. J., P. H. Berens, and B. E. Buell

RAPID DETERMINATION OF LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROMETRY IN THE NITROUS OXIDE-HYDROGEN FLAME. *Anal. Chem., 47(7):1045-1049, June 1975. 19 refs.*

The use of the nitrous oxide-hydrogen flame for determination of lead in gasoline is described. Use of this flame allows direct aspiration of gasoline with virtually no non-atomic absorption at the 2833 A lead resonance line. Effects of gasoline composition are practically eliminated by virtue of the efficient combustion process. Lead is determined by simple treatment of gasoline with an excess of iodine and liquid ion exchanger, prior to measurement vs. standards containing lead chloride in unleaded gasoline. This procedure provides a rapid direct measurement of lead in gasoline from trace levels to 0.10 g/U. S. gal. At Pb levels above 0.10 g/gal, a dilution with unleaded gasoline is recommended due to nonlinearity in the analytical working curve at high concentrations and possible complications in the iodine conversion reaction.

53406 **APTIC NO. 78110**

Mathur, H. B.

EXHAUST ODOUR AND SMOKE EMISSION FROM DIESEL ENGINES AND THEIR CONTROL. *J. Inst. Engrs. (India) (London) vol. 55:169-173, March 1975. 10 refs. (Presented at the Paper Meeting, Semi-annual, Bangalore, India, July 20-21, 1974.)*

The different types of diesel emissions are analyzed and the effect of various operating parameters on the nature and composition of diesel exhaust pollutants is examined. Test results show that diesel exhaust is less harmful than the invisible exhaust from gasoline powered automobile engines. The major problem is the repulsive color and odor of diesel exhaust. Several methods for the control of diesel smoke and odor are considered, including fuel additives, catalytic mufflers and electrostatic precipitators, engine derating, and use of auxiliary fuels. (Author abstract modified)

53407 **APTIC NO. 77958**

Mattis, Robert P.

AN EVALUATION OF CHARGING AND TAPPING EMISSIONS FOR THE BASIC OXYGEN PROCESS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-15.1.)*

Stepwise regression techniques were used to quantify interactions between process variables and an emission factor for an average sized basic oxygen furnace. Detailed process information and variables concerning slag, oxidation refractory, and material handling losses were used to find correlations between process data and particulate emission concentrations during charging and tapping operations. A direct logarithmic relationship was found between the emission factor and the average vessel capacity, and a curve was plotted from this data to estimate an emission factor for a given sized basic oxygen furnace. An annual emission of about 6500 tons/yr was estimated for an average basic oxygen furnace.

53408 **APTIC NO. 78057**

McCorriston, L. L. and R. K. Ritchie

DETERMINATION OF LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROMETRY USING A TOTAL CONSUMPTION BURNER. *Anal. Chem., 47(7):1137-1139, June 1975. 11 refs.*

An atomic absorption method for the determination of lead in no-lead (less than or equal to 0.05 g Pb/gallon) and low-lead (less than or equal to 0.5 g/gallon) gasolines that requires no chemical pretreatment and no special care in spectrometer operation is described. The method employs a total consumption burner, an isooctane-acetone solvent, and calibration with lead alkyls. Regular/premium, low-lead, and no-lead gasolines are diluted 3/250, 5/100, and 25/50, respectively, with isooctane- acetone and then run along with blanks and calibration solutions. Calibration curves are linear. The absorbance for a gasoline containing 0.05 g Pb/gallon is typically 0.21. The lead contents of regular/premium and low-lead gasolines are read directly from the calibration curves, and the lead content of no- lead-gasolines is determined from the calibration curve using absorbances which have been corrected for background variations. The background correction is obtained for sample and blank using the hydrogen continuum lamp at 283.3 nm or by use of a nearby non-absorbing line. The precision of the method is excellent; duplicates at the 95% confidence level do not differ by more than 0.002, 0.019, and 0.073 g/gallon for no-lead, low-lead, and regular/premium gasolines, respectively.

53409 **APTIC NO. 77705**

Milkovich, Joseph J.

AN ENVIRONMENTALLY SOUND WASTE MANAGEMENT AND RESOURCE RECOVERY SYSTEM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.3.)*

A pyrolysis/waste heat utilization system for disposing of 1000 tons/day of combined residential/commercial/industrial solid waste, sewage sludge, and digester off gas, while producing a usable energy in the form of steam is described. The basic pyrolysis process consists of heating the shredded waste in an oxygen deficient atmosphere to a temperature high enough to pyrolyze organic matter into gaseous products and residue consisting mostly of ash, carbon, glass, and metal. Steam generated as the main product of the process is provided to a separately located sea water desalination facility. Producing steam on the pyrolysis system site, rather than sending low BTU gas to the desalination boilers, permits stricter control over potential contaminants. Total elimination of visible plumes and nearly total elimination of particulates, sulfur dioxide, nitrogen oxides, and hydrocarbons is achieved in this manner. (Author abstract modified)

53410 **APTIC NO. 77934**

Miller, David F. and Arthur Levy

EXHAUST HYDROCARBON RELATIONSHIPS WITH PHOTOCHEMICAL AEROSOL FORMATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-16.3.)*

Motor vehicle exhaust from six nonleaded fuels of varying hydrocarbon compositions were analyzed chromatographically and irradiated from 6 hr in a smog chamber to study the effect of gasoline composition on the formation of secondary exhaust aerosols. The exhaust was generated by operating a 1971 modified Chevrolet on a chassis dynamometer. A significant correlation existed between the percent aromatic content and secondary aerosol formation as measured by light scattering, with the mass concentration of the aerosol increasing with increased aromatic percentages. The magnitude of the relationship was moderate, however, in comparison with other factors known to affect aerosol concentrations. In the important region of aromatic content, between 25 and 50%, the aromatic content of the exhaust did not alone predict the reactivity of the exhaust in forming aerosols. (Author conclusions modified)

53411 **APTIC NO. 77642**

Mitchell, R. E., B. R. Taylor, G. C. Williams, and A. F. Sarofim

CONTROL OF NITRIC OXIDE EMISSIONS FROM GAS-RANGE BURNERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass, June 15-20, 1975, Paper 75-09.3.)*

The behavior of well-defined laminar diffusion flames was investigated to determine a strategy for the control of nitrogen oxide emissions from range-top burners. Detailed concentration and temperature profiles revealed that NOx formation is confined primarily to the fuel-lean side of the flame surface where temperature and oxygen availability are suitable for NOx production. The Zeldovich mechanism was the dominant mechanism for nitric oxide production in the laminar methane-air diffusion flame investigation; NO formation via CH and NH intermediates was relatively insignificant. The high activation energy associated with the Zeldovich mechanism indicated that NOx emissions can be reduced by the redistribution of energy within the flame zone. Studies of the effects of changes in burner port size, number, and location on NOx emissions indicated that only modest reductions in emissions (up to 30%) can be achieved by the aerodynamic quenching of the combustion gases. However, by using various configurations and sizes of wire mesh to redistribute energy within the flame, reductions in NOx emissions up to threefold were achieved. (Author abstract modified)

53412 **APTIC NO. 77665**

Morgenstern, L. N., P. Morgenstern, C. E. Mears, and D. H. Barrett

AIR QUALITY MODELING ANALYSIS OF POWER PLANTS FOR FUEL CONVERSION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-33.6.)*

Diffusion modeling analyses for 63 east coast power plants at which selected units were considered as candidates for fuel conversion from oil- to coal-firing were performed to evaluate the potential impact of these conversions on ambient sulfur dioxide and particulate concentrations. All of the fuel conversions appeared to permit attainment of the primary annual SO2 and particulate ambient air quality standards. Fuel conversions at 36 of the plants did not appear to endanger attainment of the primary 24-hour suspended particulate standard, and attainment of the primary 24-hour SO2 standard did not appear to be jeopardized at 27 of the plants. All of the plants indicated attainment of the 24-hour suspended particulate standard for the 1972 base year, and 53 of the plants indicated attainment of the 24-hour SO2 standard. The fuel conversion at 26 plants where attainment of all standards was possible was estimated to result in an annual reduction in fuel oil usage of about 3 billion gallons. The largest reduction in fuel oil was projected for the New York-New Jersey area followed by the New England states. (Author abstract modified)

53413 **APTIC NO. 77825**

Naugle, Dennis F.

POLLUTION EMISSION ANALYSIS OF U. S. AIR FORCE AIRCRAFT AND AIRBASES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-03.1.)*

Pollution emissions for a complete landing and takeoff cycle are presented for 17 of the most common Air Force aircraft, and average contributions of each aircraft operating mode toward the total emissions are computed. A breakdown of major emission categories typically found in air bases reveals that aircraft are clearly the dominant source. Military and civilian vehicle contributions at Air Force bases are quite low in comparison to their contributions at civil airports. Total emission inventory comparisons of military versus civil airports indicate that large military air bases produce roughly the same emission quantities as those observed at Washington National Airport. Whether these emission levels cause a significant air quality impact is unknown since local emission contributions and local meteorological factors are not yet fully assessed. Emission inventory data are tabulated for carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates. (Author abstract modified)

53414 **APTIC NO. 78384**

Ondov, J. M., W. H. Zoller, Ilhan Olmez, N. K. Aras, G. E. Gordon, L. A. Rancitelli, K. H. Abel, R. H. Filby, K. R. Shah, and R. C. Ragaini

ELEMENTAL CONCENTRATIONS IN THE NATIONAL BUREAU OF STANDARDS ENVIRONMENTAL COAL

AND FLY ASH STANDARD REFERENCE MATERIALS. *Anal. Chem., 47(7):1102-1109, June 1975. 19 refs.*

The concentrations of 37 elements in National Bureau of Standards (NBS) standard coal (SRM 1632) and 41 in fly ash (SRM 1633) were measured by four laboratories. Most of the measurements were done by instrumental neutron activation analysis. In addition, one laboratory used instrumental photon activation analysis and another counted the natural radioactivity to determine concentrations of potassium, thorium, and uranium. The results are in good agreement with the values given by NBS. Average concentrations for the 37 elements in the coal standard and 41 elements in the fly ash standard are presented for comparison with results that may be obtained by other laboratories. (Author abstract modified)

53415 **APTIC NO. 77834**

Patterson, Robert M. and Edwin L. Meyer, Jr.

AN APPROACH FOR RELATING TRAFFIC TO AMBIENT CARBON MONOXIDE CONCENTRATIONS AT SIGNALIZED INTERSECTIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-44.4.)*

A technique for relating traffic to ambient carbon monoxide concentrations at signalized intersections is described. The procedure first estimates average queue lengths at each approach to an intersection. Emissions at each approach are characterized as step functions. Relatively high emissions occur over the estimated queue lengths, and these elevated emissions are attributable to emissions from accelerating/decelerating and idling vehicle operation being added to those emissions from cruising vehicles which are projected to occur if the intersection does not exist. Only cruising emissions are assumed to occur upstream and downstream from the calculated queue lengths. The procedure is tested using traffic data and ambient CO data collected at an intersection near a regional shopping center. Good agreement between mean calculated and observed impacts on ambient CO concentrations is obtained. Comparisons between individual estimated and observed impacts generally agree within a factor of two. (Author abstract modified)

53416 **APTIC NO. 77830**

Pattison, John N. and Gerald A. Issacs

A DIAGNOSTIC PROCEDURE USING EMISSION DATA TO REDUCE AUTOMOTIVE AIR POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1975. 20 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-42.5.)*

A diagnostic procedure for reducing automobile emissions of carbon monoxide and hydrocarbons was developed. The procedure utilized data from the New Jersey ACID (Acceleration, Cruise, Idle, Deceleration) emission test which uses a constant volume sampling technique to measure emissions on a g/mi basis while the vehicle is driven on a chassis dynamometer. Individual mode data generated during the test prescribe specific service steps that the mechanic should follow in order to diagnose emission problems correctly and remedy those problems. A test of the procedure on 89 cars selected to be representative of the entire vehicle population by make and model revealed a reduction in hydrocarbons of from 7.73 to 6.02 g/mi (22%) and in carbon monoxide emissions of from 61.2 to 39.4 g/mi (36%). Substantial improvement in exhaust emissions appears possible if the procedure is used in conjunction with a periodic vehicle inspection program. (Author abstract modified)

53417 **APTIC NO. 77844**

Polgar, L. G., R. A. Duffee, and L. J. Updyke

ODOR CHARACTERISTICS OF MIXTURES OF SULFUR COMPOUNDS EMITTED FROM THE VISCOSE PROCESS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-55.2.)*

The odor qualities and thresholds of mixtures of sulfur compounds emitted from a viscose plant were investigated. Carbon disulfide, hydrogen sulfide, and carbonyl sulfide are the three major emitted compounds. Ambient odor intensity and quality vary as a function of distance from the plant. Synthetic preparations of mixtures of the compounds were presented using the dynamic dilution technique to an odor panel. Mixtures of H2S and CS2 exhibit the odor quality of H2S even when the mixture contains 91% CS2. The odor threshold concentration of this mixture is still a factor of 5 lower than that of CS2 alone. The presence of H2S even in small quantities, acts as an enabling mechanism for odor perception. Carbonyl sulfide exhibits an odor quality of burnt rubber with a milder rotten egg quality also discernible. The odor threshold concentration is 0.1 ppm. (Author abstract modified)

53418 **APTIC NO. 78231**

Reed, Stuart B.

POLLUTION--PHYSICAL AND MENTAL (A) PHYSICAL POLLUTION: AN ENVIRONMENTAL STITCH IN TIME AND ECOLOGY CENTRES. *Roy. Soc. Health J. (London), 94(6):278-285, 1975. 12 refs.*

The sources and effects of air pollutants in the home in Great Britain are discussed. Peak concentrations of fluorocarbons from aerosol spray cans can reach 20 ppm, with 1 ppm a common level in the average home. The main sources of indoor air pollution is the combustion products from unflued gas appliances. The combustion products contain water vapor, carbon dioxide, carbon monoxide, nitrogen oxides, and trace quantities of aldehydes and hydrocarbons. Concentrations of CO can reach 200 ppm. This compares to the air quality standard in the United States which limits the maximum 1 hr average concentration of CO to 35 ppm. A survey conducted in the United States show that 25% of all home appliances discharge CO into the atmosphere and 24% of these discharge CO in the range of 200 ppm. Wind turbulence created by new buildings and man-made sources of low-frequency noise and infrasound are also considered. There is a need for consideration of pollution goals in the planning stages of new construction, as well as for more public awareness of pollution problems, for which ecology centers are proposed.

53419 **APTIC NO. 78358**

Rosehart, R. G. and R. Chu

METHODS FOR IDENTIFICATION OF ARSENIC COMPOUNDS. *Water, Air, Soil Pollut., 4(3/4):395-398, July/Aug. 1975. 8 refs.*

Dust samples from two mineral processing operations, a gold extraction plant and an iron ore pelletizing operation were analyzed for arsenic. Sample analysis was carried out by use of colormetric, volumetric, X-ray fluorescence, and X-ray diffraction techniques. There are large amounts of arsenic trioxide in the gold roaster dust and relatively small fractions of As2O3 in the pelletizing plant dust. Arsenic +3 forms (CH3)3AS with methane in the presence of microorganisms and has caused human poisoning through exposure in air. Methane is recognized as the most concentrated hydrocarbon in the environment. If As +3 continues to be released in air, very high concentrations of (CH3)3As are expected to build up in the environment. (Author abstract modified)

53420 **APTIC NO. 77736**

Sell, L. Joe and John J. Conway

DEVELOPMENT OF AN EMISSION INVENTORY PROGRAM FOR A COMPLEX EMISSION SOURCE. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-53.2.)

An Emission Inventory Program developed to study the emissions from the Western Electric manufacturing plant at Lee's Summit, Missouri is reviewed. The emissions emanate from approximately 780 individual pieces of exhausted equipment via 800,000 CFM of air through 225 different exhaust systems. Water scrubbers, cyclone dust collectors, and electrostatic precipitators are used on 30 of the 225 exhaust systems. The project has two phases. Phase I consists of the primary firm data, boiler and incineration information, and drawings showing the physical location of the scrubbers, the exhaust systems, and the individual pieces of exhausted equipment. Phase II consists of three computer generated reports: a listing of each contaminant from each piece of exhausted equipment; a listing of contaminant of all pieces of equipment emitting that contaminant, and a group of contaminants by class (sulfur dioxide, nitrogen oxides, particulates, oxidants, hydrocarbons). (Author abstract modified)

53421 **APTIC NO. 77704**

Shuster, William W.

PARTIAL COMBUSTION AND PYROLYSIS OF SOLID ORGANIC WASTES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.2.)*

A process for reforming high molecular weight organic compounds in solid waste materials such as paper, leaves, and dried sewage sludge into simpler compounds of economic interest was investigated. Finely divided waste was charged to a fluidized bed in which the solids were supported in an air-nitrogen stream containing less oxygen than that required for complete combustion. Heat was supplied electrically through the walls of the reactor to supplement the exothermic heat of reaction. Gaseous products of pyrolysis reactions were condensed and collected on a series of traps held at progressively lower temperatures. Over 20 compounds were obtained and identified. Runs with high air-nitrogen ratios generally favored the formation of highly oxygenated compounds, while low air-nitrogen ratios promoted the formation of aliphatic and aromatic hydrocarbons.

53422 **APTIC NO. 77992**

Shuster, William W.

EVAPORATION RATES OF EXHAUST PRODUCTS DISCHARGED FROM OUTBOARD ENGINES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-25.6.)*

The extent of evaporation of hydrocarbons exhausted from outboard engines which accumulate as a liquid film on the surface of the water body was investigated. Evaporation rates were measured by placing weighed samples of liquid exhaust products collected from a medium size outboard engine into a flask attached to a rotary evaporator operating in a water bath held at a desired temperature. The evaporated products were carried off by a measured flow of air introduced into the flask. Tests were also conducted on samples of gasoline, oil, and the gas-oil mixture used as the engine fuel. The percent evaporation showed a high initial rate that fell off rapidly as a function of time and approached a steady value. Approximately 65% of the exhaust products was removed from the water by the process of evaporation. The evaporative flux showed a high initial value which decreased with time. An increase in temperature resulted in increased evaporative rates. (Author abstract modified)

53423 **APTIC NO. 77708**

Smith, Leo T., Richard A. Matula, and Fu-Kang Tsou

SUMMARY OF SOLID WASTE INCINERATION AND ENERGY RECOVERY IN HOSPITALS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-38.6.)*

The use of on-site incineration as a hospital solid waste disposal alternative to landfill disposal is discussed. Hospital solid waste disposal needs fall within the capacity range of small-scale incinerators (200-4000 lb/hr), and controlled air designs appear to be well suited to hospital use. These units are capable of meeting existing air quality standards for particulates without costly control devices. Approximately 45% of the hospitals responding to a survey of the Pennsylvania, New Jersey, and Deleware area indicate an interest in incineration alone as a waste disposal method. Approximately 55% of the same hospitals indicate an interest in incineration and energy recovery. Energy recovery in hospitals is most likely to be in the form of hot water or low pressure steam generation (i.e., heat recovery). (Author summary modified)

53424 **APTIC NO. 77801**

Strasser, Erwin, Wilfried Sander, and Erich Wacker

THE EFFECT OF PISTON DESIGN ON PERFORMANCE DATA AND RELIABILITY OF PETROL ENGINES. *(Einfluss der Kolbenkonstruktion auf Betriebskennwerte und Funktionssicherheit von Ottomotoren). Text in German. Automobiltech. Z. (Stuttgart), 77(9):254-259, Sept. 1975. 16 refs.*

Reduced lead content of gasoline for internal combustion engines results in increasing danger of piston failure caused by irregular combustion. Crown scorching and ring land fracture can occur. Though combustion chamber parts cannot withstand long periods of irregular combustion, good thermal conduction and piston cooling are required to provide a safety margin. For 2-stroke engines, the influence of top land clearance and ring side clearance on piston temperature were investigated. In automotive engines, ring land chambers, particularly at the edges of the top ring groove, can control both ring fluttering and blowby. The effects of piston ring and piston design details are discussed. Emissions are hardly influenced by the piston, with the exception of unburned hydrocarbons. There is a nearly linear relationship between HC and the top land clearance. If the top land is bevelled, there is a 30-40% decrease of HC. Power losses by piston friction can be reduced by using axially smaller rings while avoiding spring-loaded oil rings. Together with a flexible design and low thermal expansion of the piston skirt, a reduction of friction power losses of up to 0.8 hp can be achieved.

53425 **APTIC NO. 77653**

Sturm, Joseph C. and David S. Kircher

HIGHWAY VEHICLE OPERATING CHARACTERISTICS FUEL ECONOMY AND EXHAUST EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p. 1975. refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-54.2.)*

Automobile operation and its related impact on vehicle fuel economy and exhaust emissions are described. Vehicle operating characteristics are presented in tabular form on the basis of road type, demographic location, and the nationwide aggregate. Descriptors of vehicle operation include mean speed, speed distribution, speed change, and the percent time and distance in mode. These numerical descriptors are essential inputs in predicting fuel consumption on the nation's highways. Current methodologies for estimating automobile emissions are briefly reviewed. An emission estimation methodology incorporating vehicle operating characteristics is presented. (Author abstract modified)

53426 **APTIC NO. 78075**

Sutton, Glen W.

INDUSTRIAL HYGIENE SURVEYS OF U. S. MINES. *Bureau of Mines Information Circ., 8666:171-218, 1975. (Presented at the Symposium on the Use of Diesel Powered Equipment in Underground Mining, Pittsburgh, Pa., Jan. 30-31, 1973.)*

Mine air contaminants found in underground mines using diesel powered equipment were analyzed in three underground coal mines and four underground noncoal mines. The investigations include systematic sampling of the mine atmosphere to obtain engineering information relative to air contamination originating from diesel exhaust in underground mines. Although individual spot samples for carbon monoxide and carbon dioxide indicate elevated peak concentrations, the time weighted averages were below the current TLV of 50 ppm and the suggested lower values of 35 ppm. Concentrations of nitrogen dioxide and aldehydes did not exceed their ceiling TLV s. Samples for particulates in some mines ranged above the TLV. Samples are cumulative samples of all particulate including mineral dust which was present and do not reflect diesel soot concentrations. The effects of equipment travel speed, air velocity, travel distance, and duty cycle are as significant as size and type of engine in determining levels of contaminants at a given location and time.

53427 **APTIC NO. 77874**

Van Lierop, Beryl and Peter W. Kalika

MEASUREMENTS OF HYDROCARBON EMISSIONS AND PROCESS VENTILATION REQUIREMENTS AT A TIRE PLANT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-12.4.)*

Hydrocarbon emissions and process ventilation requirmeents were measured at a tire manufacturing plant with the aid of a flame ionization detector used in conjunction with specially designed test enclosures. Unit solvent emission and evaporation factors were calculated and translated into measures of ventilation efficiency. The efficiencies were found to be inadequate to satisfy the Connecticut hydrocarbon emission regulation requiring 85% control. The average atmospheric emission resulting from green tire spray operations was 0.22 lb/tire, while that resulting from undertread cement operations was 0.010 lb/sq ft. The flame ionization method for measuring total hydrocarbons provided an accurate, reliable, and uncomplicated means for quantifying hydrocarbon evaporation. (Author abstract modified)

53428 **APTIC NO. 77701**

Yamate, George, John Stockham, William Vatavuk, and Charles Mann

AN INVENTORY OF EMISSIONS FROM FOREST WILDFIRES, FOREST MANAGED BURNS, AND AGRICULTURAL BURNS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-36.6.)*

An inventory of emissions from forest wildfires, forest-managed burns, and agricultural burns is presented for 55 states and territories. The data are tabulated on acreages burned, tons of fuel consumed per acre burned, and the defined pollutant yield for each of the burn categories. The estimated levels of particulates, carbon monoxide, hydrocarbons, and nitrogen oxides are: 391,890, 3,688,376, 553,256, and 92,209 tons, respectively, for forest wildfires; 144,114, 1,356,368, 203,455, and 33,909 tons, respectively, for managed burns; and 103,920, 978,072, 146,711, and 24,452 tons, respectively, for agricultural burns.

53429 **APTIC NO. 77702**

Yamate, George, John Stockham, David Becker, Thomas Waterman, Patricia Llewellen, and William M. Vatavuk

DEVELOPMENT OF EMISSION FACTORS FOR ESTIMATING ATMOSPHERIC EMISSIONS FOR FOREST FIRES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-36.7.)*

Emission factors for forest fires are derived from pollutant yield data (pounds of pollutant released per ton of forest fuel consumed) and estimates of the fuel consumed per acre. Pollutant yield data are obtained from measurements made on laboratory, burning tower, experimental field, and managed fires. The emission factors are computed for nine Forest Service regions and five forest groups. Each ton of forest fuel consumed yields an estimated 17 lb of particulates, 140 lb of carbon monoxide, 24 lb of hydrocarbons (expressed as methane), and 4 lb of nitrogen oxides. The yields appear to be independent of the type of fuel burned. Sulfur oxide yields are negligible. Emission data for wildfires occurring during 1971 are also presented. (Author abstract modified)

53430 **APTIC NO. 78382**

Yoder, G. L., Jr. and P. J. Pagni

AUTOMOTIVE EMISSIONS FROM FUEL SULFUR. *Chemosphere, 4(2):63-64, April 1975. 5 refs.*

The conversion of combustion produced sulfur dioxide to condensed sulfates was investigated. The fuel was isooctane with thiophene added to control the fuel sulfur content at 0%, 0.03%, and 0.15% by weight. X-ray photoelectron spectrometry analysis of exhaust with 0.15% fuel S shows that sulfide is approximately three times as populous as sulfate. X-ray fluorescence analyses show that less than 0.5% of the fuel S is converted to S bearing particulate. Engine generated carbon particulate does not serve as an effective catalyst for sulfur dioxide oxidation under conditions simulating vehicle exhaust.

53431 **APTIC NO. 75934**

Olson Labs., Inc., Anaheim, Calif.

VEHICLE PROCUREMENT FOR TESTING BY FTP AND SELECTED SHORT CYCLES AT EPA (FINAL REPORT). *Office of Air and Waste Management Contract 68-03-0452, Rept. EPA-460/3-75-006, 25p., May 1975.*

NTIS: PB 243640/AS

Vehicle procurement procedures associated with the testing of automobiles for exhaust emissions via the Federal Test Procedure and other selected short cycles are described. A total of 150 privately-owned 1974 model year vehicles were procured and delivered to the Environmental Protection Agency Motor Vehicle Emissions Laboratory in Ann Arbor, Michigan. These vehicles (Chevrolets with 400 cu in. engines, Plymouths with 318 cu in. engines, and Ford Pintos with 140 cu in. engines) were selected from the registration records for Wayne County, Michigan.

53432 **APTIC NO. 77962**

Iowa Energy Policy Council

COMPARISON WITH ALTERNATIVES. *In: Nuclear Energy: 1975. Rept. H 2030, p. 29-31, May 1975.*

The means by which electricity is currently produced in the U. S. and possible future alternatives are discussed. Coal burning must be considered as the current alternative to nuclear power because of the decreasing availability of cleaner fuels. Fossil fuel generating plants are a major contributor of sulfur oxides, particulate matter, and nitrogen oxides. Nuclear power does not produce any of these pollutants, but involves the releases of radioactive gases such as tritium, krypton, and xenon. The statistical health effects of one year s operation of a 1000 megawatt nuclear power plant would amount to the following numbers of extra fatal cancers anually: 0.001 from the uranium fuel cycle up to fuel fabrication, 0.0008 from operation of the plant with the prevailing level of controls, and 0.13 from fuel reprocessing. The statistical health effects from sulfur oxides alone of one year s operation of a 1000 megawatt coal fired plant are from 12 to 250 extra deaths. Accidents, occupational health, thermal pollution, transmission lines. energy resources, mining impact, economics, safeguards, and wastes are also considered.

53433 **APTIC NO. 78111**

Study Group on Technical Aspects of Efficient Energy Utilization, Princeton, N. J.

EFFICIENT USE OF ENERGY. *Phys. Today, 28(8):23-27, 32-33, Aug. 1975. 17 refs.*

The technical aspects of energy use are considered for three categories of end use: the house, the automobile, and industrial processes based on chemical and physical changes of state. The energy consuming aspects of the services a house is asked to provide are: warmth in winter; coolness in summer; hot water; light; food storage, and a means for cooking. A number of suggestions are reviewed including better insulation, increased heat capacity for thermal averaging, and better use of house aerodynamics and convective heat flow to minimize losses due to air infiltration and at the windows. Automobile efficiency could be improved by better matching of the engine and transmission to the load. Energy dissipated in the brakes could be recovered and stored. Air-drag coefficients could be reduced, and newly designed tire suspension systems could yield large reductions in the power requirements of road vehicles. Industrial processes may be classified into three general types: change in chemical state, change in physical state, and fabrication. For the chemical processes not only is there critical technical work to be done to improve device efficiencies but also a considerable amount of basic research is needed on microscopic mechanisms, particularly those at surfaces. Important reductions in energy use in the physical change processes could come through a better understanding of the mechanisms of separative processes, such as solute mobility and transport through membranes, and by the development of materials with better selectivity for different molecular species. Opportunities for improving fabrication efficiency are more difficult to generalize. (Author abstract modified)

53434 **APTIC NO. 78241**

INDUSTRIAL REFUSE INCINERATION IN A ROTARY KILN. *(Industriemuellverbrennung im Drehrohrofen). Text in German. Umweltschutz Staedtereinig. (Vienna), 12(6):159-160, 1975.*

In the largest synthetic leather manufacturing plant in Eastern Europe in Chropyne near Gottwaldov (USSR), all solid and liquid wastes ranging from paper, plastic production wastes, and trash to solvents, old oil, aqueous dimethylformamide solution and sludge from electroplating are incinerated in a rotary kiln. The kiln was designed for a throughput of 200 to 570 kg/hr solid and pasty material. In the afterburning chamber, 200 kg/hr of liquid waste material can be burned. The waste gases from incineration are cooled to 300 C by injection of air and discharged through a stack. Behind the injector, the waste gas volume was measured at 15,000 cu m/hr. The waste gases carried 500 mg dust/cu m, 100 ppm carbon monoxide, between 20 and 100 ppm sulfur dioxide, 80 ppm nitrogen oxides (of which 0.5 to 3 ppm are nitrogen dioxide) and between 300 and 1100 ppm hydrogen chloride. Czechoslovakian waste gas emission standards have not yet been exceeded, and the kiln has been in operation for 2500 hr.

53435 **APTIC NO. 78264**

Kita Ward Office, Tokyo (Japan), Construction and Public Nuisance Div.

INVESTIGATION REPORTS ON THE ENVIRONMENTAL ATMOSPHERE AT A CHEMICAL PLANTS REGION IN THE KITA WARD. *(Kita-ku kagaku kojo shuken chiiki kankyo taiki chosa hokoku). Text in Japanese. 37p., April 1975.*

Environmental pollution (odors, toxic gases) in the vicinity of chemical plants in the Kita Ward was investigated to obtain basic data for pollution control. Air samples collected at 14 locations from November 1974 - February 1975 were analyzed by gas chromatography and mass spectrometry. Data of concentrations of propane, propylene, butane, butene, pentane, hexane, heptane, benzene, ethyl benzene, xylenes, methanol, acetone, trichloroethane, ethyl acetate, and ethylene dichloride are given. Toluene (maximum concentration 1180 ppb) and methanol (maximum concentration 20600 ppb) showed the highest concentrations. The results, analyzed in relation to the chemicals handled at four plants, showed no significant correlation. Data of environmental pollution due to automotive exhaust gases obtained by sampling at intersections are also presented. In the Kita Ward, pollution was caused primarily by chemical plants.

1974

53436 **APTIC NO. 78274**

Ako, Tomeko, Kuniaki Hata, Yukihiro Yoshikawa, Tomoko Hayami, Kiyoe Kataoka, Haruo Ikegami, and Yoshihiko Fujita

ANALYSIS OF THE EXHAUST PRODUCTS OF A JET ENGINE. *(Jetto engin ni okeru haiki gasu no bunseki). Text in Japanese. Koku Igaku Jikkentai Hokoku (Aeromed. Lab. Rep. Japan Air Force Self- Defense Forces), 15(3):145, Dec. 1974. 9 refs.*

The exhaust gas from a turbojet and turboprop engines is analyzed for nitrogen dioxide, nitric oxide, carbon monoxide, carbon dioxide, nitrogen, ammonia, acetaldehyde, sulfur dioxide, and hydrocarbons. The exhaust gases at four different engine power settings; ground idle, flight idle, cruise, and maximum power, were collected in Mylar bags. Nitrogen, CO2, and hydrocarbons were analyzed by gas chromatography from the collected gas. Other pollutant analyses included the azo method for NO, the sodium hydroxide absorption method for NO2, the pararosaniline method for SO2, the Nestler method for NH3, and the detection tube method for both CO and acetaldehyde. The average NO levels in the turbojet engine analyses were 36.1 ppm and 102.7 ppm at ground idle and maximum power settings, respectively, and the NO level increased with increasing power settings of the engine. The average NO levels in the turboprop engine analyses were 73.0 ppm and 207.0 ppm at the ground idle and maximum power respectively. The NO2 concentration found in the turbojet exhaust gas ranged from 0.5 to 0.6 ppm, but did not vary with the power setting. However, the NO2 concentration in the turboprop exhaust gas increased with the increased engine power and the average value was 4.3 ppm and 29.2 ppm at the ground idle and maximum power operations, respectively. No SO2 could be detected by the method from any of the exhaust gas at all power conditions. The CO level was 500 ppm at ground idle and 217 ppm at the maximum power setting of turbojet engine, while in the turboprop engine the values were 800 ppm and 70 ppm, respectively. The CO concentration in the exhaust gas decreased inversely to the increased power settings.

53437 **APTIC NO. 78083**

Corn, Morton

CHARACTERISTICS OF TOBACCO SIDESTREAM SMOKE AND FACTORS INFLUENCING ITS CONCENTRATION AND DISTRIBUTION IN OCCUPIED SPACES. *Scand. J. Resp. Dis. (Copenhagen), (91):21-36, 1974. 29 refs.*

Characteristics of tobacco sidestream smoke and factors influencing its concentration and distribution in occupied spaces are discussed. Emission rates are estimated for major components of the particulate and gas phases of sidestream smoke. Data are tabulated for emission of particulates, tar, nicotine, benzo(a)pyrene, pyrene, phenols, carbon monoxide, carbon dioxide, nitrogen oxides, ammonia, and water. The particulate phase is characterized by a modal particle size of 0.15 micron and a coagulation constant of approximately 4 times 10 to the - 10th power ml/sec immediately following generation. An equation is available to predict the concentrations of tobacco smoke pollutants in occupied spaces if the pollutant generation rates are reliably known, the room ventilation rate is characterized, together with a mixing factor for the room, and the emission of the pollutant from other sources or its entry with background air can be specified.

53438 **APTIC NO. 78146**

Hoshika, Y., S. Kadowaki, I. Kojima, K. Koike, and K. Yoshimoto

ANALYSIS OF SULFUR COMPOUNDS AND ALIPHATIC AMINES FROM FISH MEAL TREATMENT PLANT BY GAS CHROMATOGRAPHY. *(Gasukuromatogurafi ni yoru gyochokotsu shori kojo kara no io kagobutsu oyobi shibozoku amin rui no bunseki). Text in Japanese. Preprint, the Chemical Society of Japan, 1974. (Presented at the Chemical Society of Japan, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974.)*

Waste gases from a fish meal dryer and cooker were trapped with liquid oxygen and analyzed by gas chromatography. A glass tube 3 m by 3 mm packed with 25% TCEP on Shimalite (AW, DMCS) 60/80 mesh, and, as a carrier gas, nitrogen 50 ml/min were used. The waste gases from the dryer contained at least 11 components including carbonyl sulfide 0.08 ppm, hydrogen sulfide 0.91 ppm, carbon disulfide 0.03 ppm, methyl mercaptan (MM) 0.32 ppm, n-propylmercaptan 0.4 ppm, dimethyldisulfide (DMDS) 0.17 ppm, and trimethylamine (TMA) 0.42 ppm. The waste gases from the cooker contained at least 7 components including COS 0.03 ppm, H_2S 4.2 ppm, CS_2 0.02 ppm, MM 5.2 ppm, DMDS 0.09 ppm, and TMA 1 ppm.

53439 **APTIC NO. 78098**

Isola, Vittorio, Antonio Crespo, and Marcello Giubilo

TOXIC GAS ZONES INVOLVED IN TUNNEL CONSTRUCTION. *(Studi per l attraversamento di zone con presenza di gas tossici). Text in Italian. Rass. Med. Ind. Igiene (Lavoro), 21(9):245-253, Sept. 1974.*

In July 1973, while constructing the Cape Calava tunnel for the Messina-Palermo Expressway, a seepage of underground gas and water caused a shutdown of work, pending careful investigation. Prof. Rittman, world-renowned vulcanologist, diagnosed the problem as originating from magmatic intrusions in the process of cooling and solidification, a process that could be expected to continue for a protracted geological period. The escaping gas consisted of carbon dioxide (98.07%), methane (0.61%), hydrogen sulfide (0.08%), oxygen and nitrogen. This phenomenon resembles the mofettes of the nearby Lipari Islands. The way in which the contractors constructed a shell by injection of concrete and acrylic resins into the surrounding terrain, the use of explosives in a pressurized chamber (2.2-2.5 atm), emergency equipment of various kinds, and the construction of a sealing apparatus to prevent further entry of noxious gases. The latter had to be resistant to the corrosive combination of H_2S and water.

53440 **APTIC NO. 77715**

Kosinov, O. I.

EMISSION OF NITROGEN OXIDES INTO THE ATMOSPHERE BY METALLURGICAL PLANTS. *(Vybroc okislov azota v atmosferu metallurgicheskimi agregatami). Text in Russian. Metall. Gornorudn. Prom.), no. 3:79-80, 1974. 2 refs.*

Major sources of nitrogen oxides emissions in metallurgical plants are reviewed. The nitrogen oxides emissions from open-hearth furnaces vary depending on the stage of the operation. They are highest during charging and tapping, and lowest during melting and refining. Most of the nitrogen oxides formed in ore-dressing plants are formed within the charge, and the nitrogen oxides concentrations are higher in the vacuum chambers than in the hearth. Boiler plants integrated in metallurgical plants emit small amounts of nitrogen oxides when they are operated on blast-furnace gas. Due to the reduced nitrogen oxides emissions, converters are favorable environmentally. Two-stage combustion, and prevention of the local overheating of the oxygen-nitrogen mixture in combustion chambers are the basic means of controlling nitrogen oxides emissions in metallurgical plants.

53441 **APTIC NO. 78377**

Kurosawa, Keiji

FUNDAMENTAL APPROACH TO POLLUTION-FREE PROCESSES. *(Mukogai purosesu no kihonteki kangaekata). Text in Japanese. Preprint, the Society of Chemical Engineers, Nagano, p (B-17)-(B-26), 1974. (Presented at the Society of Chemical Engineers Summer Symposium on Chemical Engineering, Nagano, Japan, Aug. 1-3, 1974.)*

Japan has the world s highest industrial density. In 1972, in the region around Tokyo Bay, 70 million kl/yr of crude petroleum were imported, and 36.5 million kl/yr of heavy oil were burned. Gasoline and light oil for 5 million automobiles were consumed in the amount of 4 million kl/yr, and domestic light oil consumption was 5 million kl/yr. Naphtha consumption was 11 million kl/yr in 1972. With three major steelworks in the area, annual coal consumption was more than 10 million tons. On non-windy days, a sulfur dioxide concentration of 1 ppm is possible. The nitrogen oxides concentration can be more than a few 100 ppm. In dealing with pollution, topographical and meteorological considerations must be taken into account, in addition to environmental capacity. Disposition of waste water is more difficult than dealing with atmospheric pollution. The natural purification capacity is insufficient. Compounds such as DDT, benzene hexachloride, and polychlorinated biphenols do not disappear naturally. Heavy metals, although initially insoluble in many cases, can become soluble. There are limits to pollution prevention technology and energy supply. Energy usage review and use of closed systems are fundamental. In a given region, industrial development must be limited according to environmental capacity, and pollution dispersion requirements.

53442 **APTIC NO. 77909**

Lagerwerff, John V.

CURRENT RESEARCH IN HEAVY METALS IN SOIL, SEDIMENT AND WATER: JANUARY 1973-OCTOBER 1974. *California Univ., Berkeley, Lawrence Berkeley Lab. and National Science Foundation-Research Applied to National Needs, Trace Contam. Conf. Proc., Annu., 2nd, Pacific Grove, Calif., 1974, p. 16-47. 309 refs. (Aug. 29-31.)*

NTIS: LBL-3217

Cadmium, copper, mercury, manganese, lead, and zinc are discussed in relation to analytical techniques, sources of contamination, flow through the ecosystem, accumulation in soils and sediments, uptake by plants, and abatement. A general section deals with heavy metals as a group. (Author abstract)

53443 **APTIC NO. 78362**

Narita, Isao, Kazuo Tanaka, and Kiyoko Sakamoto

AIR POLLUTION IN OSAKA DISTRICT - THE FIRST REPORT - THE RECENT TRANSITION OF POLLUTION BY SULFUR OXIDES. *(Osaka-fu ni okeru taiki osen - daiippo - saikin sunenkan no io sankabutsu ni yoru osen no suii). Text in Japanese. Osaka Sangyo Daigaku Ronshu (Osaka Inst. Ind. Bull. Nat. Sci.), no. 40, 1974.*

Heavy oil consumption increased from 5,176,000 kl in 1967 to 8,624,000 kl in 1971, and cokes from 1,879,000 tons to 2,716,000 tons. However, coal consumption decreased from

2,611,000 tons to 435,000 tons during the same period. Total emissions of sulfur dioxide in Osaka City decreased from 116,000 tons in 1967 to 74,000 tons in 1971, from 107,000 tons to 82,000 tons in Sakaichi City, but increased from 3000 tons to 11,000 tons in Takaishi City. The sulfur contents in heavy oil had been reduced steadily from 2.16 to 1.27% in Osaka city, from 2.18 to 1.09% in Sakaichi city, and 2.81 to 1.54% in Takaichi city during the same period of time. The general reduction of total SO2 emissions in most of the area was due to the enforcement of air pollution prevention laws issued in 1967 and 1968, environmental standards issued in 1969 and revisions of the air pollution prevention laws issued in 1970.

53444 **APTIC NO. 77914**

Pitts, James N., Jr.

AIR POLLUTION CONTROL: MONITORING, MECHANISMS, AND MODELS. *California Univ., Berkeley, Lawrence Berkeley Lab. and National Science Foundation-Research Applied to National Needs, Washington, D. C., Trace Contam. Conf., Proc., Annu., 2nd, Pacific Grove, Calif., 1974, p. 7-15. 29 refs. (Aug. 29-31.)*

NTIS: LBL-3217

Exceptionally stringent control of pollutant emissions is usually costly, while undercontrol can produce wholly unacceptable health effects. Oxidant levels in California s South Coast Air Basin are not improving. Combinations of sulfurous and photochemical smog can cause enhanced conversion of sulfur dioxide to visibility- degrading and toxic particulate sulfate and may also promote synergistic health effects not observed for either type of smog alone. Because many crop yields are significantly decreased by exposure to a variety of pollutants, the effects upon agriculture from present levels of smog and pollution possibly resulting from alternative energy sources should be recognized and assessed. Determining the relationships between emissions and air quality is crucial to developing strategies for solving air pollution problems. Three types of urban smog formation models are discussed: empirical models, which relate observed levels of pollutants in a specific air basin to meteorological events, semiempirical models which mix theoretical prediction with empirical correlations and ab initio, largely theoretical models, which include an emission inventory, a theoretical meteorology package, and a chemical reaction mechanism. Modelling of chemical transformation requires laboratory data on reaction sequences, accurate values for rate constants, and verification by comparison with observed data. Examples are used to illustrate the importance of accurate emission inventories and consistent monitoring.

53445 **APTIC NO. 78147**

Tanimoto, M. and Hiromichi Uehara

DETECTION OF ACROLEIN IN ENGINE EXHAUST GAS BY STARK MICROWAVE HOLLOW-SPACE SPECTROMETER. *(Shutaru soin maikuroha kudo bunkoki ni yoru enjin haigasuchu no akurorein no kenshutsu). Text in Japanese. Preprint, the Chemical Society of Japan, 1974. (Presented at the Chemical Society of Japan, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974.)*

Exhaust gas from an engine was passed through a glass tube packed with phosphorus pentaoxide and was collected in a 300 cc sample tube containing 1 g of diatomic earth fire brick powder (60/80 mesh). The tube was heated to prevent condensation. The tube was immersed in an acetone-dry ice bath for 30 min, and nitrogen oxygen, and carbon dioxide gases were removed. The tube was then heated at 200 C and the gases were introduced into a hollow-space resonator where the pressure was set at 0.2 torr. The microwave frequency was set at 8910.5 MH and the stark voltage was swept from 0 to 1000 V/cm. Acrolein showed a peak near 300 V/cm stark voltage while formaldehyde gave a strong peak at higher than 600 V/cm. Exhaust gas emitted by an engine at 4000 rpm and 3.5 kg torque contained 5 ppm of acrolein. The result was in good agreement with that obtained by a chemical method.

53446 **APTIC NO. 77883**

Timokhov, K. D. and N. P. Borovichenko

DUST FORMATION AT OPEN MINING OPERATIONS OF THE BASHKIR COPPER-SULFUR CONCERN. *(Issledovanie pyleobrazovaniya na otkrytykh gornykh rabotakh Bashkirskogo medo-sernogo kombinata). Text in Russian. Bor ba Silikozom, vol. 9:97-100, 1974.*

The free silicon dioxide (SiO2) content in copper-zinc ores and in the native rocks, in waste from wells and boreholes, and in suspended and deposited particualtes was studied. Free SiO2 content in deposited particulates decreases with distance from the source of dust, but quartz being less abrasive than other components forms coarse, easily deposited particles. The dispersity factor, defined as the percentage of less than 5 molal SiO2 fractions, of suspended particulates is higher by 21%. The similarity between the size compositions of the two kinds of particulates is explained by meteorological conditions at the mine, particularly by strong winds interfering with dust differentiation; slight differentiations of mine dust were observed during drilling. Drilling and loading operations give rise to better differentiated fine suspended dust. (Author abstract)

53447 **APTIC NO. 78372**

Trestianu, Domnina Maria

ANALYTICAL METHOD FOR INTERNAL COMBUSTION ENGINES-GENERATED EXHAUST GASES. *(Metode de Analiza a Gazelor de Combustie de la Motorele Cu Ardere Interna). Text in Romanian. Studii si Cercetari de Chimi, 22(1):91-111, 1974. 191 refs.*

The most commonly used method of detecting carbon monoxide is gas chromatography, with adsorption on silica gel, activated charcoal, alumina, or porous polymers. A catharometer or ionization with helium is used for detection. The effect of pollution is studied with an ECO-lyser, based on the electrooxidation of carbon monoxide to carbon dioxide. For a quantitative analysis of nitrogen oxides, the following methods are used: chemical analysis, instrumental analysis, spectroscopy, chemiluminescence, electrochemical methods, and gas chromatography. Of the hydrocarbons, olefins contribute to the formation of photochemical smog. The most commonly used methods for determining olefins are: infrared or ultraviolet absorption, reaction of olefins with bromine, spectrophotometric titration, colorimetry, and gas chromatography. Chemical methods and paper chromatography have shown that the most common oxygen derivatives of hydrocarbons are formaldehyde, acetaldehyde, acetone, methyl acetone, acrolein, crotonaldehyde, and more than 30 other compounds, mainly secondary alcohols, aldehydes, and ketones.

53448 **APTIC NO. 78374**

THE PRESENT AND FUTURE OF SELECTING PETROLEUM REFINERY SITES. *(Sekiyu seiseirichi no genjo to shorai). Text in Japanese. LP Gasu (Liq. Pet. Gas), 16(5):19-23, May 1974.*

More than 90% of the petroleum refineries in Japan are located in the so-called Pacific belt zone and concentrated in the high-consumption area along Tokyo bay, Osaka bay, Ise bay, and the Seto inland sea coast. These petroleum refinery sites were fairly well established by 1965. After 1965, new refinery sites were sought at a distance from the major consumption area. The refinery site on the coast is convenient for unloading crude oil from tankers and eliminates the land transportation cost of crude oil. The site near the consumption area also reduces the cost for transporting the refined product. The characteristic littoral industrial conglomerate built around the refinery is probably the ultimate form of industrial site planning, for the products from the petroleum refinery can be delivered directly to nearby petrochemical and other factories by pipes. The problems involved in selecting a refinery site from the standpoint of air and water pollution and safety are discussed. Environmental protection measures, control methods for air, water, noise, and odor pollution, are described. The safety measures taken, such as the planning of factory sites, creation of sufficient safety zones, improvement of ground and building foundations, storage tanks, piping, safety equipment, fire extinguishing facilities, and safety procedures for emergencies are described. The concept of a closed system for a petroleum refinery is also discussed.

1973

53449 **APTIC NO. 77718**

Chalabov, V. G., A. K. Dzhragatspanyan, R. V. Malov, and O. M. Gabrielyan

TOXIC EMISSIONS OF AN M-PROCESS DIESEL ENGINE. *(Toksicheskaya kharakteristika dizelya s M-protsesessom). Text in Russian. Prom. Arm. (USSR), no. 9:66-69, 1973.*

The composition and toxicity of the exhaust gases emitted by an M-process diesel engine mode D 2156 NM 6 V was studied. Compared with uncharged four-stroke diesels (YaMZ-236, YaMZ-238 and YaMZ-240), the M-process diesel emitted a smaller quantity of toxic gaseous unburned products and more nitrogen oxides. The specific emissions showed, however, no difference at rated power. The soot concentration in the M-process diesel exhaust was 10 to 15 times smaller at low loads, and 5-6 times lower at high loads than that in the exhaust of uncharged diesels. The exhaust gas contained practically no carcinogenic substances. Turbocharged diesels and two-stroke, gasoline-fueled diesels emit more toxic substances than uncharged four-stroke diesels operating on gas oil. Nitrogen oxides accounted for 95-100% of the toxicity of the exhaust gases of the M-process diesel. The nitrogen oxides emissions from this diesel can be reduced by partial exhaust recirculation, exhaust cooling, reduction of the lead angle, and by humidification of the combustion air.

53450 **APTIC NO. 78373**

Hermann, Peter

WASTE GAS IMMISSIONS IN THE VICINITY OF COKING PLANTS. MEASUREMENT OF GASEOUS AND ODOROUS POLLUTANTS. *(Abgasimmissionen in der Umgebung von Kokereien. Messung gasfoermiger, geruchsbelaestigender Schadstoffe). Text in German. Schfiftenr. Lagerstaettenerfassung Bodenbewegungen Bergschaeden Ingenieurvermessung, (5):121-136, 1973. 11 refs. (Presented at the Colloq. Umweltschutz und Bergbau, Clausthal- Zellerfeld, May 10-11, 1973.)*

In the vicinity of 35 coking plants in North Rhine-Westphalia the concentrations of ammonia, phenol, hydrogen sulfide and the total amount of organic compounds were measured and the odor intensity determined by using as a criterion the degree of reduction of odor intensity with distance. Most measuring points were between 150 and 450 m from the coking plant center. HS, NH_3 and phenol were absorbed in aqueous solutions of suitable reagents, and the organic substances were adsorbed on silica gel. For the analytical determination of HS the molybdenum blue method was used. Phenol was photometrically determined after a reaction with p-nitraniline. The organic compounds were analyzed with a flame ionization detector. In a radius of less than 500 m of all 35 coking plants the odor threshold for HS was exceeded during at least one measurement day. The odor threshold of NH_3 was exceeded at 24 plants. Five plants had no intense odors and values above 0.15 mg H_2S/cu m or 0.04 mg NH_3/cu m were not measured. No correlation between the odor sensation and the immission concentration for HS as well as the odor threshold for ammonia was found. All ammonia concentrations were less than one twentieth of the maximum allowable working place concentrations. About 60% of all measured NH_3 and HS concentrations were above the odor threshold. The odor threshold of phenol was not reached.

53451 **APTIC NO. 77852**

Johnson, John H.

DEISEL ENGINE DESIGN, PERFORMANCE, AND EMISSION CHARACTERISTICS. *In: Proceedings of the Symposium on the Use of Diesel-powered Equipment in Underground Mining, Pittsburgh, Pa., Jan. 30-31, 1973. Bureau of Mines, Washington, D. C., Information Circular 8666, p. 9-46, 1975. 20 refs.*

The diesel engine emission characteristics are developed by showing what exhaust emission products are produced when 15 lb of air and 1 lb of fuel react in a combustion process. The products of perfect combustion are water, carbon dioxide, nitrogen, and oxygen. Additional exhaust emissions result from imperfect fuel and combustion and include carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, sulfur dioxide, and carbon (smoke). The method of quantizing emissions in terms of rates (g/hr) is developed. A 13-mode cycle is used to quantize the average hydrocarbon, NO_2, and CO emissions over the engine speed and brake power operating range of the engine. The general range of diesel emissions in units of concentraticas and g/bhp-hr is shown along with the general range of both spark ignition and diesel engine emissions on the 13-mode cycle. Pre-chamber turbocharged aftercooled engines exhibit the lowest overall gaseous and smoke emissions while yielding high, specific output power. Direct injection turbocharged after cooled engines exhibit emissions characteristics in the laboratory only slightly higher than that for all emissions.

53452 **APTIC NO. 77742**

Smith, J. F.

NATURAL GAS AND THE ENVIRONMENT. *Energy Dig., vol. 1973: 15-17, Sept./Oct. 1973. 6 refs. (Presented at the Institution of Gas Engineers Annual General Meeting, Clacton, England, 1973.)*

The imparting and standarization of odors in natural gas are described. Gas must, by law, possess a distinctive smell. The first odorant used was tetrahydrothiophene which imparted a positive smell to the gas when used at the rate of 1 lb/m cu ft. Current practice is to blend the gases from the various wells and and add an odorant consisting of a mixture of diethyl sulfide and tertiary butyl mercaptan. The odorant is kept in storage tanks from which it is pumped and injected into the gas stream. A problem arises when a fresh delivery of odorant will displace an equal volume of odorant vapor laden atmosphere. The gas is regarded as satisfactory if a 1% mixture of gas in air gives an odor intensity of 2.0. This means that the smell is readily identified at a concentration which is only 20% of the lower explosive limit.

53453 **APTIC NO. 77631**

Zvonov, V. A. and V. N. Malakhov

EXPERIMENTAL UNIT FOR STUDYING THE EVOLUTION OF TOXIC SUBSTANCES BY A GASOLINE ENGINE. *(Eksperimental naya ustanovka dlya issledovaniya vydeleniya toksickeskikh vshchestv benzinovym dvigatelem). Text in Russian. Dvigateli Vnutrennego Sgoraniya (Kharkov), no. 18:154-159, 1973. 4 refs.*

An experimental unit for the study of toxic exhaust components is described. The experimental unit is based upon a UD-1 single-cylinder carburetor engine whose exhaust gases are collected in two separate vessels through valve control. The exhaust gas sample to be analyzed is homogenized. The exhaust gas sampled in one vessel is used for the analysis of nitrogen oxides, and the other sample is used for the analysis of other components, such as carbon monoxide, carbon dioxide, hydrogen, oxygen, and hydrocarbons. This experimental unit permits exhaust gas sampling during individual engine cycles. The pressures inside the cylinder are recorded by means of a piezoelectric transmitter.

53454 **APTIC NO. 77790**

Combustion Technique Committee (Japan)

NITROGEN OXIDE EMISSION FROM STATIONARY INCINERATORS AND COUNTERMEASURES AGAINST THE EMISSION. *(Teichi nensho sochi ni okeru chisso sanka-butsu no hassei to sono yokusei taisaku). Text in Japanese. In: Report on the Investigation on Combustion Techniques by the Combustion Technique Committee, p. 63-99, May 1973. 27 refs.*

The mechanism of occurrence of nitrogen oxides, the relationship between the occurrence of NOx and the combustion conditions, the effect of nitrogen present in the fuel, methods to suppress the occurrence of NOx, and various NOx countermeasures are discussed. Also discussed are the characteristics of NOx, the complexity of the state of occurrence of NOx, the relationship between the temperature in the combustion chamber and the appearance of NOx, the relationship between the air-fuel ratio and the formation of NOx, and the relationship between the occurrence of NOx and the mixing state of in the combustion chamber. Nitrogen oxide countermeasures include: improvements in the supply of fuel and air, increasing the heat capacity of the combustion gases, increasing the heat absorption ratio in the combustion chamber, and a change of fuels. Methods for the determination of NOx are also given in detail.

53455 **APTIC NO. 77791**

Combustion Technique Committee (Japan)

DUST EMISSION IN STATIONARY INCINERATORS AND ITS CONTROL. *(Teichi nensho sochi ni okeru baijin no hassei to sono yokusei taisaku). Text in Japanese. In: Report on the Investigation of Combustion Technique by the Combustion Technique Committee, p. 100-134, May 1973. 72 refs.*

A comprehensive report is given on the classification of stationary incinerators, characteristics of dusts, the amount of dust discharged from various origins, the mechanism of soot formation, the effects of various factors on the formation of dusts, methods to suppress the formation of dust, and methods for the measurement of dust. Explanations for the structure of soot, the chemical composition of soot, the polymerization of two-carbon molecules, the reduction of carbon monoxide, processes of condensation, condensation of polycyclic hydrocarbons, the role of oxygen in the formation of soot, and the effect of pressure are provided. Important factors that affect the formation of dust include: the combustion state, the degree of excess of air, the diameter of fuel particles sprayed from nozzles, the flow rate of air, the furnace combustion load, the amount of air supplied for the combustion, the temperature of the combustion air, the capacity of the burners, the partial pressure of oxygen in the burning air, additives in the fuel, and the type of fuel. Dust collectors and various methods for the determination of dust are described.

CONTROL METHODS

1975

53456 **APTIC NO. 78268**

Akamatsu, Hideaki, Kazuhiko Shiroya, and Akiyoshi Morita

MOISTURE-REMOVING DEVICE IN THE EXHAUST GAS RECIRCULATION SYSTEM. *(Haiki gasu sai junkan sisutemu nai no suibun jyokyo sochi). Text in Japanese. (Toyota Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-25091. 7p., Aug. 21, 1975. (Appl. Jan. 7, 1972, 2 claims).*

A moisture removal device in the exhaust gas recirculation system was designed to exchange the exhaust gas remaining after the engine is turned off in the conduit connecting exhaust system and intake system with fresh air to prevent moisture condensation and removing the already condensed water, scale and micro- particulates which are the causes for deterioration and malfunction. The moisture removal device comprises an air injection device connected to the one end of second valve system with the other end connected to the conduit of exhaust gas recirculation system at the location in the upper stream side of the first valve for regulating the flow of exhaust gas. The moisture removal device is controlled by an electric circuit connected to the ignition switch, by which the first and second valve systems and the air injection device are actuated.

53457 **APTIC NO. 78379**

Allsup, J. R. and R. D. Fleming

OPTIMUM AUTOMOTIVE USE OF THE COMBUSTION CHARACTERISTICS OF GAS FROM COAL-LOW POLLUTION CONSIDERATIONS. *Bartlesville Energy Research Center, Okla., Bureau of Mines RI 8040, 19p., 1975. 12 refs.*

The characteristics of simulated coal gas were investigated as an automotive fuel in two multicylinder vehicles in a standard and high compression ratio engine configuration. While using simulated coal gas fuel, increasing the engine compression ratio improved the fuel economy and vehicle performance, but increased hydrocarbon emissions by 40%. Photochemical reactivity of exhaust hydrocarbons is extremely low using coal gas fuel. An oxidizing catalyst used with the simulated coal gas fuel eliminates all but trace amounts of carbon monoxide, and reactive hydrocarbons in the exhaust. Spark gas geometry and firing voltage are varied and, within the range tested, have little effect on vehicle performance and emissions using simulated coal gas fuel. (Author abstract modified)

53458 **APTIC NO. 78208**

Aoi, Tsuyoshi

AN EXHAUST GAS PURIFIER FOR AN INTERNAL COMBUSTION ENGINE. *(Nainen kikan yo haiki gasu seijo sochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-28263. 3p., Aug. 21, 1975. 1 ref. (Appl. Dec. 29, 1970, claims not given).*

An exhaust gas purifier for an internal combustion engine is described. The purification facility, cylindrical in shape, consists of three parts: an adiabatic expansion chamber, a collecting chamber, and a condensation chamber. The adiabatic expansion chamber is placed beside the engine, where the exhaust gas enters and larger particles in the exhaust gas are precipitated. The condensation chamber is located at the end of the purification cylinder, and removes moisture from the purified exhaust gas. The collecting chamber, which is located between the adiabatic expansion and condensation chambers, is divided into several sub-chambers by discs with small holes. The connecting tubes connect the two sub-chambers, and an exhaust gas cleaning agent enters them at the outer side of the connecting tubes. The connecting tube in the end sub-chamber (i.e., the tailpipe side) is capped with a solid metal disc so that the exhaust gas must go through a sub-chamber with the exhaust gas cleaning agent at least once. Since no localized purification of the exhaust gas is done in any of the sub-chambers, the deterioration of the cleaning agent is uniform between the sub-chambers.

53459 **APTIC NO. 78209**

Aoi, Tsuyoshi

AN EXHAUST GAS PURIFIER FOR AN INTERNAL COMBUSTION ENGINE. *(Nainen kikan yo haiki gasu seijo sochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-28264. 3p., Aug. 21, 1975. 2 refs. (Appl. Dec. 29, 1970, claims not given).*

An exhaust gas purifier for an internal combustion engine is described. The cleaning cylinder has several chambers divided by several discs having small holes, and the chambers are connected through connecting tubes. The connecting tube had several small holes and an exhaust gas cleaning agent is retained at the outer side of the connecting tube in the chamber. The diameter of the connecting tubes in chambers is larger for the chamber on the engine side than on the tailpipe side. When the exhaust gas enters the cleaning cylinder, adiabatic expansion of the gas occurs, and large particles in the exhaust gas are precipitated. The exhaust gas travels towards the tailpipe and is purified in the chambers. There is a condensation chamber at the end of the series of cleaning chambers, and the moisture content in the exhaust gas condenses. The condensed water is collected at the bottom of the cleaning cylinder.

53460 **APTIC NO. 78225**

Arrandale, Roy S.

POLLUTION CONTROL IN FUEL-FIRED TANKS. PART 6. FILTER HOUSE. *Glass Ind., 56(5):12-13, May 1975. 18 refs.*

A baghouse is described that is effective in a small optical specialty regenerative furnace. The temperature in baghouses has to be kept above about 280 F to avoid the high dew point of sulfur trioxide hydrates, which will plug the filter. A baghouse recently has been installed on fiberglass melting, using fiberglass filters, wherein the gas is quenched with water sprays. A baghouse has been installed on a large glass melting furnace, and is operating successfully after solution of a gas cooling problem concerning the use of the stationary air preheater upstream from it. Filter bags cannot remove noncondensibles, sulfur oxides, and nitrogen oxides, unless a filter is combined with some form of reactor bed, or a dry reactive or absorption powder put in suspension in the gas stream. A continuous bed filter seems to have much more promise. The use of expendable filter belts is discussed. A panel filter treats the gas by causing it to flow horizontally across a bed of granular solid disposed in a tall narrow panel. The bed is held in place by louvered walls. The angle of repose stops spillage out of the panel but allows gas passage into it. Such a device can achieve 99% filtration efficiency on power station fly ash.

53461 **APTIC NO. 78189**

Asada, Yoshiharu, Masataka Fuse, Katajiro Kinoshita, and Tamotsu Watanabe

TREATMENT METHOD FOR GAS EMITTED FROM THE HEATING PROCESS OF SYNTHETIC FIBERS. *(Gosei seni no kanetsudoki ni hassei suru gasu no shori hoho). Text in Japanese. (Teijin Ltd. (Japan)) Japan. Pat. Sho 50-17567. 3p., June 21, 1975. (Appl. Nov. 20, 1972, 1 claim).*

Lubricants are commonly applied to synthetic fibers to facilitate drawing and after-treatments. During the heating process, the lubricant or decomposition products of the lubricant are released into the surrounding air, which is often odorous and flammable and can not be discharged with the treatment. The suction air duct is placed near the heat processing equipment, and the exhaust gas drawn into the suction duct is led to the wet-type electric precipitator, where the oily components are separated. The oily components adsorbed on the collecting electrode are washed off by circulating washing water. When the concentration of oily component in washing water reaches 20%, the washing water is left standing at 40 C, and the supernatant oily component is separated.

53462 **APTIC NO. 77662**

Ayers, Karl C. and Jerry L. Parr

ODOR CONTROL FEATURES OF A NEW KRAFT MILL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1975. ? refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-34.3.)*

An odor control system at a new kraft pulp mill is described. Odorous gases from the digesters are piped to the recovery boiler for incineration. Off gases from the evaporators are condensed in small surface condensers, and the non-condensible gases are scrubbed with a weak wash at the hot well. The gases are then incinerated at the lime kiln. Hydrogen sulfide resulting from the acidification of evaporator condensates in an acid sewer is transported to a gas-fired incinerator for destruction by combustion. An electrostatic precipitator and four low-energy wet scrubbers are used to treat flue gas from the recovery boiler. A low-energy cyclonic type scrubber with a packed bed section of polypropylene saddles is installed on the dissolving tank vent to remove reduced sulfur compounds generated while dissolving smelt. A wire mesh demister pad is in the stack following the scrubber. This system is effective in controlling both reduced sulfur compounds and particulates. Residual odors from the lime kiln are handled in a scrubber containing caustic soda and water. A completely enclosed hood of reinforced polyester fiberglass is installed around three-stage drum washers, and the wet odorous gases are evacuated and heated prior to introduction into the secondary air fan of the recovery boiler. An activated carbon filter is used to control any odor emissions resulting from volume changes in a tank receiving black liquor spills from the strong waste collection system. All black liqu[illegible] storage tanks, boil-out tanks, soap skimmer tanks, saltca[illegible] makeup tanks, and precipitator saltcake makedown tanks are either vented with blowers to the secondary air fan on the recovery boiler or are collected and blown into the tertiary windbox.

53463 **APTIC NO. 78106**

Azarniouch, M. K., E. J. Farkas, N. E. Cooke, and A. J. Bobkowicz

REMOVAL OF MICRON-SIZE PARTICLES FROM GASES BY TURBULENT DEPOSITION AND DIFFUSIOPHORESIS. *Can. J. Chem. Eng., vol. 53:278-285, June 1975. 24 refs.*

When one gaseous or vapor component diffuses across a space occupied by another component, there is a tendency to entrain and remove particles in the micron size range suspended in that space. The application of this phenomenon, called diffusiophoresis, is studied as a means of air pollution control when pollutant particles are suspended in a gas stream in turbulent flow. Turbulent deposition also results in removal of particles from the gas stream under these conditions. The test system chosen for study was sulfuric acid droplets suspended in air, with water vapor as the diffusing component. A concentration gradient was established by passing the mixture through a vertical tube whose walls were cooled. Experimental particle collection efficiencies agreed with efficiencies calculated from a theoretical model of the system. The energy requirement of this pollution control technique was analyzed. (Author abstract)

53464 **APTIC NO. 78079**

Barrere, Marcel and Roland Borghi

STUDY OF MINIMAL POLLUTANT PRODUCTION IN COMBUSTOR BY THE KATZ ALGORITHM AND BY A NUMERICAL METHOD. *Aerotec. Millili Spazio, 54(3):155-165, June 1975. 11 refs.*

The optimization of a series of homogeneous chemical reactors with a schematic description of the whole combustor is presented. In the first part, optimization is made by a graphic method, explained simply for a set of three reactors. Gas composition, temperature evolution along the combustor, and residence time in each reactor are the three main parameters affecting nitric oxide production. In a second part, with a view to optimize on a larger number of parameters, a numerical method of conjugate gradients was used. An optimization technique which is both simple and realistic is described. When the reactors are mounted in a series, the minimum content of the combustor outlet is provided by an infinity of homogeneous reactors, a configuration corresponding to a tubular reactor.

53465 **APTIC NO. 77812**

Bauerle, George L., S. C. Wu, and Ken Nobe

REDUCTION OF NITRIC OXIDE WITH AMMONIA ON NOBLE METAL CATALYSTS. *Ind. Eng. Chem. Prod. Res. Develop., 14(2):123-130, June 1975. 39 refs.*

The reduction if nitric oxide with ammonia on alumina-supported platinum, palladium, ruthenium, and rhodium catalysts was studied in flow reactors at temperatures between 120 and 400 C. The presence of oxygen in the gas mixture enhanced the reduction of NO on Pt and Pd below about 230 C, whereas O2 inhibited NO reduction on Ru and Rh. Considerable nitrous oxide was produced on both Pt and Pd in the presence of O2. Using a simulated power plant stack gas containing 14% carbon dioxide, 5% water, 3% O2, and 250-1000 ppm NO, the conversion of NO was a function of the NH3/NO inlet ratio from 0.5-2.3. The presence of O2 also accelerated the decomposition of NO on Pt in the simulated flue gas. Maximum decomposition occurred with 2% O2 present in the flue gas at a temperature of 300 C. (Author abstract modified)

53466 **APTIC NO. 77648**

Belles, Frank E., Robert L. Himmel, and Douglas W. DeWerth

MEASUREMENT AND REDUCTION OF NOX EMISSIONS FROM NATURAL GAS-FIRED APPLIANCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-09.1.)*

Measurements of carbon monoxide and nitrogen oxide emissions from water heaters and room heaters are reported along with measures for reducing NOx emissions from gas range burners. The average NOx emission level from water heaters is higher than that obtained for ranges and forced air furnaces. Carbon monoxide emissions increase with yellow flame (poorly adjusted) conditions due to lack of sufficient oxygen for complete combustion. Nitrogen dioxide emissions for room heaters are slightly higher than those from furnaces and water heaters. The application of the principles of high primary air and controlled secondary air for NO2 reduction combined with flame temperature reduction makes possible the design of burner systems for the minimization of NOx. In one method, the burner input rate is controlled by means of an electric snap-acting solenoid valve, while another method involves manually controlling the rate and operating by means of a dual burner system utilizing a double duty valve. Both methods substantially reduced NOx emissions from those obtained with contemporary range top burners (5.0-10.0 ppm versus 90.0-100.0 ppm). An increase in thermal efficiency of 21-27% is also achieved.

53467 **APTIC NO. 77826**

Beltran, Michael R.

REMOVAL OF TEXTILE SMOKE EMISSIONS BY ELECTROSTATIC PRECIPITATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 7p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-20.3.)*

The effectiveness of the Poly-Stage Electrostatic Precipitator in removing smoke emissions generated by textile manufacturing operations is discussed. The precipitator's major advantage is that it requires very little energy to remove textile oil smokes. Its collection efficiency is extremely high in the submicron range, with efficiencies approaching 99%. In operation, smoke particles are passed through an ionizer where they are charged. After the ionizing section there is a series of collecting plates in which the particles are attracted to the ground plate; the viscosity of the particles is such that they drain from the plates into a sump. This action tends to flush and clean the plates. The precipitator can also be used as an odor abatement device if condensation is allowed to occur. This usually occurs at temperatures of between 140 and 200 F for textile dyeing and finishing.

53468 **APTIC NO. 78242**

Bendig, L.

CONTRIBUTION OF THE AIR CLEANER AND ITS ACCESSORIES TO THE REDUCTION OF EXHAUST EMISSIONS OF INTERNAL COMBUSTION ENGINES. *(Beitrag des Luftfilters und seiner Zubehoeraggregate zur Verminderung der Schadstoffemission von Verbrennungsmotoren). Text in German. Automobiltech. Z. (Stuttgart), 77(9):270-273, Sept. 1975.*

The air cleaner of an internal combustion engine has, in addition to the task of cleaning intake air from solid matter such as dust and soot, other essential functions such as abating intake noise and regulating the quality of exhaust gases and engine operation. A number of devices at the intake of the engine have been developed which are connected with the air cleaner. There is a special device for recycling exhaust gas secondary air for the afterburning of exhaust gases, as well as a carbon canister and a regulator valve for absorption of vapors from the fuel tank and carburetor flow chamber. Various temperature switches govern additional pneumatic devices in the engine. Recycling of blowby gases from the crankcase is done either by crankcase ventilation together with a pressure regulator valve or by crankcase ventilation with airflow limitation. The intake air temperature regulation with wax thermostat guarantees, over the entire load range of the engine, an air intake mixture of constant temperature. A pneumatic regulator feeds warm air at high temperatures to the engine at low speeds and fresh air of ambient temperature at high speeds.

53469 **APTIC NO. 77887**

Beutner, Heinz P.

A NEW TECHNOLOGY FOR PARTICULATE EMISSION CONTROL ON METALLURGICAL FURNACES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-66.5.)*

A technique for the control of fine particulate emissions from metallurgical operations is described. The method utilizes a gas cooling system followed by a cyclone and a fabric filter. The gas is initially cooled to 250 F to allow for the use of low cost fabric materials in the downstream filter. The cyclone is provided for fire protection and prevents the carry-over of large burning particles into the filter. The fabric filter results in the efficient filtration of submicron metallurgical fumes. Pressure drops of under 8 in. of water and long fabric life are consistently achieved at air-to-cloth ratios of up to 5:1. Residual dust emissions are less than 0.01 grains/standard cu ft. Examples of several installations in the metal industry are provided.

53470 **APTIC NO. 78240**

Block, Seymour S., Jim B. Sharp, and Larry J. Darlage

EFFECTIVENESS OF GASES IN DESULPHURIZATION OF COAL. *Fuel, 54(2):113-119, April 1975. 8 refs.*

The effect of air, steam, and hydrogen on the desulfurization of 10 U. S. high volatile bituminous coals was investigated. Air treatment is most effective at 450 C where an average of 38% total sulfur, comprising 51% of the inorganic S and 20% of organic S, is removed. With steam at 600 C, 61% of the total S, 87% of inorganic, and 25% of organic is lost. Hydrogen is not effective below 850 C, but at 900 C, 86% of the total S is dispelled. Without oxidative pretreatment the S is much more difficult to remove; after oxidative pretreatment at 300 C for 10 min followed by treatment with H2 at 900 C, as much S is removed in 4 min as in 60 min without the pretreatment. With raw coal, heating under nitrogen cooked in or fixed some of the S making it more difficult to remove with H2. Following oxidative pretreatment, heating for up to 1 hr did not lessen the reduction of S with H2. For temperature swelling coals with large quantities of organic S, heating at 300 C in air followed by reduction with H2 at 900 C permits rapid discharge (3-10 min) of the organic as well as the inorganic S, to produce a smokeless product with a CV (per unit of product) similar to the fuel value of the untreated coal. (Author abstract modified)

53471 **APTIC NO. 78071**

Bowlen, Kennard L.

ENERGY RECOVERY FROM EXHAUST AIR. *Aust. Refrig., Air Cond. Heat., 29(2):26-28, 37, 41, Feb. 1975.*

The recovery of energy from exhaust air is described. Appreciable savings are possible in heating and cooling equipment, fuel, maintenance, and other operating costs by recovering energy from exhaust air before it is thrown away. A higher ventilation rate of outdoor air improves the controlled environment by offsetting the negative pressure problems that plague many industrial buildings, purges or dilutes noxious odors, bacteria and other microorganisms, and toxic or hazardous dusts or vapors. Building and health codes establish ceiling levels or airborne contaminants and outdoor air ventilation rates. There are several types of air to heat exchangers: rotary air to air exchanger; plate type exchanger; run around, coils, and pump exchanger; run around, multiple tower, dessicant spray exchanger; and single tube, evaporator condenser exchanger.

53472 **APTIC NO. 77720**

Bradway, Robert M., Reed W. Cass, and Norman F. Surprenant

FRACTIONAL EFFICIENCY OF A UTILITY BOILER BAGHOUSE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-66.3.)*

The fractional efficiency of a fabric filter baghouse operating on a small coal fired utility boiler was determined. Total mass loadings were obtained by sampling upstream and downstream of the baghouse using Method 5 techniques, and particulate size distributions were obtained with in-stack impactors. A mean mass efficiency of 99.84% with a standard deviation of 0.11% was obtained from a total of 22 tests. The mean mass median diameter of particles at the baghouse inlet was 18.9 micron, while the particle diameter at the outlet was 8.7 micron. The fractional efficiency curve over the particles size range of 1-10 micron was fairly smooth, with collection efficiencies being greater for larger particles. The collection efficiency was greater than 99% over the entire size range.

53473 **APTIC NO. 78304**

Brown, H.

THERMAL RECOVERY FROM INCINERATION PROCESSES. *Plant Eng., 19(5):11-13, May 1975. 4 refs. (Presented at the Waste Heat Recovery Conference, London, England, Sept. 1974.)*

Many constituents of industrial refuse have a high heating value which, under suitable conditions, can be used as a contribution to the heat and power requirements of a factory. Methods of heat recovery vary, but, in general, it is most convenient to generate steam or hot water by means of a waste heat boiler. It is unlikely that the heat recovered will provide all the heat requirements of a factory, but suitable interconnections with controls between the waste heat boiler and the normal steam or hot water mains will allow the waste heat to be used to its maximum capability. Refuse can also be used as a fuel for processes requiring heat directly from flue gases. Refuse should not be fired as an additive to other fuels in a combustion chamber, since the air requirements for different fuels are different. Fuel shortages, economics, and control of air pollution are also discussed.

53474 **APTIC NO. 77931**

Bump, Robert L.

ELECTROSTATIC PRECIPITATOR MAINTENANCE Survey. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-15.5.)*

Results from a survey of four major industries using electrostatic precipitators to determine the users satisfaction from an operational and maintenance viewpoint are presented. The majority of the users were satisfied with the performance of the precipitator, with 16.0% of the respondents indicating excellent operation, 52.3% indicating good operation, 22.3% indicating fair operation, and only 7.8% indicating poor operation. Discharge electrodes were the principle source of malfunction. Electrical erosion (arcing) was indicated by 61.7% of the users as being the principle cause of failure.

53475 **APTIC NO. 78302**

Bunton, J. F. and W. G. N. Buckland

RECOVERY OF LOW GRADE HEAT. *Plant Eng., 19(4):9-19, April 1975. 7 refs. (Presented at the Waste Heat Recovery Conference, London, Sept. 1974.)*

The way to approach the problem of heat recovery is stressed, and the sugar industry in particular is considered. Escape of heat is divided into two categories: primary heat loss, which can be tackled directly without any plan, and secondary heat loss, which requires planning. The first category includes radiation, leaks, safety valve blows, and faulty or bypassed traps. The second group includes engine exhaust, flash steam and cooling; condensate; blowdown heat recovery; pan, vat and evaporator vapor and hot waste effluent. Reducing the work to be done by the heat is also discussed, including reduction of process temperatures, reduction of reprocessing, quick processing and full loading, mechanical water removal, processing at a lower water content, taking advantage of exothermic or endothermic reactions, increasing yield, and reduction of power loading and compressed air waste. Reusing heat is also discussed, including flash steam, vapor collection, multiple effect, and recirculation of gas and liquids. The danger of raising steam in an economizer can be removed by circulating around the economizer. The danger of condensation of gases on the economizer tubes can be removed by circulation. Circulation can provide flash steam, which can be used for process or for feed heating. Circulation enables all the gases, possibly previously by- passed, to be passed through the economizer. An economizer can often be split into two or more separate plants on separate jobs and, by means of circulation, can absorb much extra heat without danger of steam raising or dew point trouble.

53476 **APTIC NO. 77691**

Caplan, Knowlton J.

AEROSOL FILTRATION RESEARCH FOR RECIRCULATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-32.7.)*

Requirements in aerosol research filtration for recirculation of exhausted air is discussed. Of prime importance is the development of data concerning the performance in terms of useful life and efficiency for the types of contaminants expected to pass the primary cleaner, either on a continuous penetration basis or on a breakdown basis. Such data is available to some extent for some types of air cleaning equipment, but for air filters, the historical development led to test methods and data useful for their ordinary application and not useful for the solution for this problem. (Author summary modified)

53477 **APTIC NO. 78224**

Dazai, Saburo and Kenzo Fukada

SINTERING EXHAUST GAS DESULFURIZATION EQUIPMENT. *(Shoketsu haigasu datsuryu sochi). Text in Japanese. (Nippon Steel Corp. (Japan)) Japan. Pat. Sho 50-18848. 7p., July 2, 1975. (Appl. Dec. 22, 1969, 1 claim).*

A moving-bed type desulfurization device was designed for the moving- bed or fixed-bed sintering system. A series of trays packed with adsorbent and driven by means of sprocket wheels are placed in wind boxes, where sulfur dioxide is adsorbed without lowering the temperature of exhaust gas before entering into the main duct. The SO2 concentration is normally higher in wind boxes closer to the discharge port, and 80% of the SO2 is discharged from the last one-third of the wind boxes. Therefore, the desulfurization device need be provided only for these wind boxes, reducing the cost of desulfurization. In the case of using soda ash and manganese oxides (grain size 3-5 mm) as adsorbent at 250 C, the desulfurization rates were 63.4% and 90.5%, respectively.

53478 **APTIC NO. 78273**

Echizenya, Sadayoshi and Shuichi Kamoshita

WET TYPE STACK GAS PURIFIER. *(Shisshiki haien joka sochi). Text in Japanese. (Hitachi Plant Engineering and Construction Co., Ltd. Tokyo (Japan)) Japan. Model Util. Sho 50-27978. 2p., Aug. 19, 1975. (Appl. Nov. 30, 1971, 1 claim).*

A wet-type flue gas cleaning apparatus is described. The inside of the apparatus is equipped with a de-moisturizing filter at the top and water sprinklers under the filter. There is a mat filter through which the sprinkled water passed and hits a sloped plate. There is a second sloped plate beneath the first plate and a metal screen is placed perpendicularly between them. The flue gas enters from the bottom of the apparatus and passes through the metal screen. There is a discharge wire in front of the metal screen and the small dust particles are charged and coagulated electrostatically. The coagulated particles and large particles are filtered out by the mat filter. The sprinkling water increases the filtration efficiency and removes the filtered particles from the mat filter. This apparatus is for sources emitting about 10,000 cu m/hr flue gas.

53479 **APTIC NO. 78271**

Eguchi, Nobuji

EXHAUST GAS CIRCULATION APPARATUS OF AN INTERNAL COMBUSTION ENGINE. *(Nainen kikan no haiki junkan sochi). Text in Japanese. (Hino Motors Co., Ltd., Hino (Japan)) Japan. Model Util. Sho 50- 28274. 3p., Aug. 21, 1975. (Appl. Dec. 20, 1970, claims not given).*

A device for exhaust gas recirculation to the internal combustion chamber is described. A part of the exhaust gas is extracted from the exhaust pipe by an air pump through a side tube on the exhaust pipe. The extracted exhaust gas is first bubbled through a water trap to remove carbon particles and other impurities, and then enters an exhaust gas pool. There is a tube connecting the exhaust gas pool and the intake pipe on the carburetor, which contains a magnetic valve regulated by the acceleration pedal wire. Whenever the automobile operates at maximum acceleration, the magnetic valve closes the tube for exhaust gas recirculation. The excess gas flow into the exhaust gas pool returns to the exhaust pipe through a second tube. When the throttle valve in the carburetor is not in full throttle position, the magnetic valve opens for exhaust gas recirculation. Since the extraction of exhaust gas from the exhaust pipe is done continuously by an air pump, the amount of recirculating exhaust gas is independent of the intake pressure at the carburetor.

53480 **APTIC NO. 78222**

Endo, Akira, Tetsu Takeyama, and Keixo Masuda

REMOVAL METHOD FOR NITROGEN OXIDES. *(Sanka Chisso no jokyo hoho). Text in Japanese. (Torey Industries, Inc. (Japan)) Japan. Pat. Sho 50-23665. 3p., Aug. 9, 1975. 1 ref. (Appl. Dec. 28, 1970, 1 claim).*

The catalytic reduction method for nitrogen oxides developed here is suitable for the removal of NOx in exhaust gas from nitric acid industry, flue gas, and automotive exhaust gas. In the presence of a catalyst consisting of copper oxide and alkali metal oxide, NOx is reduced to nitrogen at temperature range of 100-650 C with more than 99% conversion rate. As copper oxides, cuprous oxide, cupric oxide or copper sesquioxide is used as single component or mixtures. The hydroxide, nitrate, acetate and carbonate of copper which are converted readily to oxides at reaction temperature can also be used. As alkali metal oxides, lithium oxide, sodium oxide and potassium oxide are used. The hydroxide, nitrate, acetate, oxalate, and carbonate of alkali metals which can be converted readily to oxides are also used. Copper oxide (0.1-2.0 wt% as metallic Cu) and alkali metal oxide (0.1-1.0 weight part in regard to metallic Cu) are carried on carbon carrier such as coke, activated carbon, coal or charcoal.

53481 **APTIC NO. 77721**

Engelbrecht, Heinz L. and Neil D. Graves

ELECTROSTATIC PRECIPITATOR INSTALLATION FOR A LOW-ODOR RECOVERY BOILER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-66.2.)*

Field tests of an electrostatic precipitator serving a low-odor recovery boiler at a kraft pulping facility are described. A particulate collection efficiency of 99.85% was measured for an inlet dust loading of 3818 lb/hr. The key to successful precipitator operation was the maintenance of clean electrodes. Collection performance fell by as much as 9% in a single week due to heavy dust build-up on internal parts of the precipitator. The tests indicated that dry-bottom electrostatic precipitators can be efficiently and reliably used to control particulate matter discharged from low-odor recovery boilers. (Author conclusions modified)

53482 **APTIC NO. 77897**

Erdman, Donald A.

OPERATING EXPERIENCE AT THE DICKERSON GENERATING STATION WITH THE CHEMICO-BASIC MAG-OX SCRUBBER POTOMAC ELECTRIC POWER COMPANY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 7p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-64.6.)*

The Chemico-Basic Mag-Ox stack gas desulfurization system was operated and tested on a coal-fired boiler. The scrubber system is sized for approximately 100 MW or half the output of the 190 MW unit on which it was used. The major process related problem was in slaking of the magnesium oxide. This problem was solved with the installation of a pre-mix tank. Testing demonstrated 90% sulfur dioxide (SO2) removal at design gas flow any time inlet SO2 concentration is above 1000 ppm. The first stage, particulate removal, is very efficient. The primary cause of low operating availability has been piping leaks in the first and second stages. Operating costs for full plant scrubbing systems are discussed indicating substantial increases from estimates based on conceptual designs in the early 1970 s. (Author abstract modified)

53483 **APTIC NO. 77674**

Fielding, George H., Joseph K. Thompson, Harold F. Bogardus, and Robert C. Clark

DIELECTROPHORETIC FILTRATION OF SOLID AND LIQUID AEROSOL PARTICULATES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper H736-153.)*

The application of dielectrophoresis to a commercial high quality glass fiber air filter medium is discussed. The filtration effectiveness is improved by a factor of 10 or more when augmented by the dielectrophoresis mechanism and challenged by liquid or solid aerosols at typical air flow rates. For filter media 0.25 in. thick, impressed voltages of 7 kv (11 kv/cm) are required for optimum performance. Dielectrophoresis uses essentially no current or power, produces no corona or ozone, and needs no electrical charging of particles. The dielectrophoretic force continues to act on particles after deposition on the filter medium thereby improving adhesion and reducing blowoff. (Author abstract modified)

53484 **APTIC NO. 78211**

Fluharty, Joseph R.

PROGRESS IN AIR AND WATER POLLUTATION ABATEMENT AT A 65-YEAR-OLD MILL. *TAPPI, 58(5):83-85, May 1975. (Presented at the Environmental Conference of the Technical Association of the Pulp and Paper Industry, Denver, Colo., May 14-16, 1975.)*

Steps taken to control particulate emissions from two lime kilns, three large coal boilers, two 900-ton recovery furnaces, and a combination bark-coal furnace and odors from two recovery units at a kraft pulping mill are reviewed. A new 900 ton/day chemical recovery furnace and an electrostatic precipitator were installed in place of older recovery furnaces for the burning of black liquor. A three-stage black liquor oxidation system was placed in operation to control odorous gases from two recovery units. The installation of three electrostatic precipitators on three coal-burning boilers was performed to control particulates from these sources. A two-stage mechanical collection system with a final-stage water scrubber was install on a combination bark-coal boiler. Flooded disk scrubbers were used to control emissions from two lime kilns.

53485 **APTIC NO. 77722**

Franconeri, Peter

ELECTROSTATIC PRECIPITATOR CORROSION ON INCINERATOR APPLICATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-66.1.)*

Corrosion information based on 4 yr of operating experience with two electrostatic precipitators installed on municipal incinerators is presented. Incinerator flue gas contains a considerable amount of fly ash which reacts with acid gases (hydrogen chloride and sulfuric acid) and water vapor to form corrosive hygroscopic salt deposits. The most effective way to minimize corrosion is to keep the precipitator warm and well sealed against atmospheric air. Corten steel can be used for the precipitator shell and collector plates to further increase corrosion resistance. Mild steel can be used in an increased thickness to provide for a corrosion allowance. The expected life of a precipitator installed on a municipal incinerator which operates with weekly shutdowns is approximately 10 yr. (Author conclusions modified)

53486 **APTIC NO. 77680**

Fraser, Malcolm D.

A PREDICTIVE PERFORMANCE MODEL FOR FABRIC FILTER SYSTEMS. II. MULTICOMPARTMENT SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.7.)*

A predictive performance model for a multicompartment fabric filter system was developed based on the fundamental principles involved in fabric filtration. The equilibrium pressure-drop cycle which results from switching compartments off and on-line is calculated in an exact manner from the basic equations by an iterative algorithm. Comparison of predictions from this model with real performance data indicates that this model shows promise for predicting the collection efficiency of multicompartment fabric filter systems and for simulating their behavior under changed inlet or operating conditions. (Author conclusions modified)

53487 **APTIC NO. 77816**

Graetz, R.

POSSIBLE METHODS FOR THE CONTROL OF FLUORIDE EMISSIONS AND INFORMATION OBTAINED FROM CONTINUOUS MEASUREMENTS OF FLUORIDE IN FLUE GAS. *(Moeglichkeiten zur Beeinflussung der Fluor-Emissionen und Erkenntnisse aus kontinuerlichen Fluor-Messungen im Rauchgas). Text in German. Ziegelind. (Weisbaden), 4:130-138, April 1975. 11 refs.*

Methods for the control of fluoride emissions from brickworks are reviewed along with factors affecting the fluoride content of ceramic materials. Fluoride emission control techniques include: the prevention of fluoride discharge from materials being fired, the chemical reaction of gaseous fluoride compounds with other compounds to render the former harmless, and dilution of flue gas by the use of tall stacks. The fluoride content ceramic materials varies in concentration and depends on the chemical and mineralogical constitution and the geological origin of the clays. Thus far, no conclusions on the efficiency of methods for the continuous monitoring of fluorides in flue gas can be drawn.

53488 **APTIC NO. 77641**

Hall, Robert, E.

THE EFFECT OF WATER/DISTILLATE OIL EMULSIONS ON POLLUTANTS AND EFFICIENCY OF RESIDENTIAL AND COMMERCIAL SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburth, Pa., 27p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-09.4.)*

An evaluation of the effects of two commercially available water in oil emulsifiers on the air pollutant emissions and thermal efficiency of a residential furnace and a commercial packaged boiler was performed. The two emulsifiers tested were a mechanical device which utilized high pressure mechanical energy and a Cottell reactor which utilized low pressure mechanical and ultrasonic energy. The emulsions were tested at a constant oil flow rate with varying amounts of water over a range of stoichiometric ratios. Water/distillate oil emulsions from both emulsifiers reduced particulate mass, smoke, and nitric oxide emissions. Both exerted little effect on carbon monoxide emissions and no effect on hydrocarbon emissions. The results varied depending on the type of equipment in which the emulsifier was fired. Both emulsifiers were capable of improving efficiency under certain conditions. Combustion was improved as water was increased from 0-15% for the Cottell reactor and 0-20% for the high pressure emulsifier. (Author abstract modified)

53489 **APTIC NO. 78012**

Happel, John, Miguel A. Hnatow, Laimonis Bajars, and Michael Kundrath

LANTHANUM TITANATE CATALYST - SULFUR DIOXIDE REDUCTION. *Ind. Eng. Chem. Prod. Res. Develop., 14(3):154-158, Sept. 1975. 21 refs. (Presented at the Catalysis Society, North American Meeting, 3rd, San Francisco, Calif., Feb. 1974.)*

Preliminary studies with dry gases indicated that lanthanum titanate is an active catalyst for the reduction of sulfur dioxide to elemental sulfur by means of carbon monoxide. The carbonyl sulfide formation rate was low as a result of the catalyst's improved reduction of initially produced sulfur. The production of COS did not become significant until the CO/SO2 ratio was increased to about 2.0. A 95% SO2 removal efficiency was achieved at a CO/SO2 ratio of about 1.9. The partial pressure of CO exerted little effect on the reaction rate, even at very low concentrations of CO relative to SO2.

53490 **APTIC NO. 78272**

Hayashi, Kenji

CARBURETOR WITH AUTOMATED CHOKE VALVE. *(Jido choku-ben tsuki kikaki). Text in Japanese. (Nippon Soken Inc., Nishi City (Japan)) Japan. Model Util. Sho 50-25862. 3p., Aug. 2, 1975. (Appl. Feb. 29, 1972, claims not given).*

The autochoke on a carburetor regulated by the temperatures of atmosphere, engine exhaust gas, and engine cooling water is described. The opening of the autochoke valve is controlled by a bimetal. The air flowing through the bimetal is inducted by an air line one end of which was connected to the lower part of the throttle valve in the carburetor. The air line passes within the exhaust pipe and is equipped with an electric heater located near the bimetal housing. The electric circuit for the electric heater consists of two control switches controlled independently by the cooling water temperature and the atmospheric temperature. At low temperatures, one or the other, or both switches close. Whenever both switches close, the electric heater heats the air flowing to the bimetal, and the choke valve cuts off the amount of air supply to the carburetor.

53491 **APTIC NO. 78275**

Hayashi, Yoshimasa and Toru Yoshimura

CATALYST DAMAGE PREVENTION EQUIPMENT FOR AUTOMOBILE EXHAUST GAS PURIFICATION. *(Jidosha haiki seijoyo shokubai shoson boshi sochi). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Model Util. Sho 50-20192. 2p., June 19, 1975. 1 ref. (Appl. Sept. 11, 1970, claims not given).*

A device which allows exhaust gas to bypass a catalytic converter is described. The device employs a thermo valve. The exhaust gas enters a center pipe in the catalytic converter. A thermo valve is attached to the end of the center pipe. When the thermo valve closes, the exhaust gas flows out of the side holes of the center pipe. The catalyst is held in a second pipe which encloses the center pipe. Therefore the exhaust gas fired from the side holes passes through the catalyst bed before being emitted into the atmosphere. When the thermo valve opens, the exhaust gas flows through the center pipe without entering the catalyst bed. The thermo valve used was a bimetal valve which closed or opened the center pipe end depending upon the exhaust gas temperature. Thus the optimum bimetal combination in the thermo valve could be selected for a temperature that caused the destruction of catalyst used in the catalytic converter. Above the temperature set by the bimetal, the exhaust gas cannot enter the catalyst bed.

53492 **APTIC NO. 78064**

Heisler, Leopold and Helmut Weiss

EXPERIENCE WITH AN AUSTRIAN GAS PLANT. *Hydrocarbon Process., 54(5):157-161, May 1975. 1 ref.*

Control measures for treating sour gases at the Aderklaa, Austria gas plant are reviewed. The plant utilizes amine absorbers, scrubbers with vane-type mist eliminators, and a Claus plant. The ratio of hydrogen sulfide to carbon dioxide in the feed gas to the Claus plant is approximately 1:8 which requires an additional sulfur burner. The plant has two catalytic converters, each filled with 30 cu m of catalyst (Porocel, 2-4 mesh). Sulfur recovery depends on the throughput and age of the catalyst and ranges between 80 and 90% of the sulfur charged with acid gas to the Claus plant. The total sulfur dioxide emitted to the atmosphere is less than 20 metric tons/day.

53493 **APTIC NO. 78212**

Henderson, J. S.

PRECIPITATOR SURVEY ON NONCONTACT RECOVERY BOILERS. *TAPPI, 58(5):86-89, May 1975. (Presented at the Environmental Conference of the Technical Association of the Pulp and Paper Industry, Denver, Colo., May 12-14, 1975.)*

The results of a survey of 70% of first generation noncontact recovery salt cake precipitators in commercial operation at paper mills are reported. The survey covered 13 installations designed between 1967 and 1971 and in commercial operation between 1969 and 1973. The typical precipitator surveyed was a double chamber, four electrical field, dry flat bottom collector with drag conveyors and a steel shell. Approximately 74% of the unit tests failed to achieve guarantees based on design outlet dust levels, and 89% failed to achieve guarantees based on efficiency. Over 60% of the units surveyed required rebuilding. Owner costs averaged $81,000 per precipitator. An average of 35 days of unit downtime was required for rebuild. (Author abstract modified)

53494 **APTIC NO. 77740**

Hollands, Kenneth G. T. and Kailash C. Goel

A GENERAL METHOD FOR PREDICTING PRESSURE LOSS IN VENTURI SCRUBBERS. *Ind. Eng. Chem. Fundamentals, 14(1):16-22, Feb. 1975.*

The differential equations developed by Boll were used to predict pressure losses in venturi scrubbers accurately. Boll s equations are nondimensionalized and general solutions are obtained for both the liquid velocity and the pressure distribution in conical and rectangular duct geometries. The solutions are presented in the form of design charts and equations by use of which the pressure loss across a venturi scrubber can be readily predicted. These charts are of general validity in that they are independent of the method used to predict the droplet size produced in the scrubber. Recovery in the diffuser section of the kinetic energy delivered to the liquid in the throat is discussed. (Author abstract modified)

53495 **APTIC NO. 78395**

Homberg, Otto A. and Alan H. Singleton

PERFORMANCE AND PROBLEMS OF CLAUS PLANT OPERATION ON COKE OVEN ACID GASES. *J. Air Pollution Control Assoc., 25(4):375-378, April 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 1974, Paper 74-186.)*

The application of Claus Plant sulfur recovery units to the coke oven gas (COG) acid gases at three Bethlehem Steel Corp. plants is discussed. Emphasis is placed on the effect of components not normally encountered in the typical Claus plant application to petroleum derived gases. The feed composition to the three units is sufficiently different to expedite recognition of the source of the difficulties such as hydrogen cyanide. A substantial quantity of this material survives the burner flame. The various alternatives in its elimination are discussed. A second major contaminant in COG acid gases is particulate iron sulfide and iron cyanide which cause inorganic blockages within the Claus Plant. Short term sulfur recovery efficiencies of 95% and higher are achieved. (Author abstract modified)

53496 **APTIC NO. 77677**

Iinoya, Koichi, Kazutaka Makino, and Noriaki Izumi

OPTIMAL DESIGN OF A FABRIC FILTER SYSTEM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 1 ref. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.3.)*

A process for the determination of the optimal design of a fabric filter system was developed by formulating an economic evaluation function based on the cleaning cycle for both timer and pressure switch type filter systems. The annual cost is formulated in terms of the fixed and operating costs of a fan, the fixed cost of a filter and the fabric replacement cost. Assuming that the fabric life is constant or is equal to the allowable repetitions of cleaning cycles, the economically optimal operating conditions, such as the maximum pressure loss, average filtering velocity, number of compartments, and cleaning period are calculated to minimize the annual cost of a newly designed unit. The optimal number of compartments depends on the inlet dust concentration. For a system in which the fabric life is limited by the repetitions of the cleaning cycles, the optimal operating conditions depend on the dust concentration and the number of compartments. For a pulse cleaning type filter system with constant fabric life, the concentration may not affect the optimal conditions. (Author abstract modified)

53497 **APTIC NO. 78289**

Ishihara, Yoshimi and Hisashi Hukugawa

STUDIES ON FLUE GAS DESULFURIZATION BY LIMESTONE INJECTION PROCESS. III. DISCUSSIONS ON THE EFFECT OF FACTORS AFFECTING THE REACTION RATE OF SULFUR DIOXIDE WITH LIMESTONE PARTICLES INJECTED INTO COMBUSTION GAS. *(Sekkaiseki fukikomi ho ni yoru haien datsuryu no kenkyu. III. Nensho gasu chu ni fukikomareta sekkaiseki funmatsu to SO2 tono hanno sokudo ni taisuru shoinshi no eikyo no kosatsu). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan (Tokyo), 54(577):321-331, May 1975. 18 refs.*

During desulfurization by limestone injection, the effect of reaction conditions on the reaction rate of sulfur dioxide and limestone was investigated. The calculation method for the reaction rate and the chemical composition of the limestone and hydrated lime used are given. The effects of the initial condition of limestone particles injected, SO2 concentration, limestone particle size, gas temperature at the injection point, and types of absorbent were investigated. The apparent activation energy was calculated from Arrhenius plots for the reaction of limestone and SO2. The reaction rate increased rapidly at the initial stage of the reaction; however, it reached a plateau within 1 sec. The higher ratio of Tokunoshima limestone reaction was attributed to a slower rate of decrease in reaction rate as compared to others. The reactivity of calcium oxide increased with an increase in specific surface area and irregularity in crystal lattice structure. The specific surface area of the limestone was the sum of the outer and inner surface areas; the inner surface area was increased by instantaneous calcination as the result of carbon dioxide emission. The inner surface area decreased with the progress of the reaction with SO2; however, the rate of decrease was smaller for smaller particle sizes.

53498 **APTIC NO. 77690**

Ivey, Lee R.

VAPOR EMISSIONS FROM ORGANIC LIQUID STORAGE: DEVELOPMENT OF CONTROL REGULATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-29.2.)*

A control code development technology for emissions from volatile organic liquids in storage tanks is described using methods of calculation for storage tank losses published by the American Petroleum Institute. The code separates storage tanks into two or more groups, each of which has comparable rates of emissions. Large tanks storing low volatility liquids and smaller tanks storing more volatile materials appear in the same near equal emissions group. The use of the API formulas for gasoline are extended to single organic liquids. The empirically derived API equations are similar to theoretical gas laws and are applicable to horizontal cylinders as well as to vertical cylinders. The ratio of the dimensions of the vapor space has little effect on vapor loss. (Author abstract modified)

53499 **APTIC NO. 75928**

Jahnig, C. E.

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES. GASIFICATION: SECTION 5. BI-GAS PROCESS (FINAL REPORT). *Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0629, Program Element 1AB013, ROAP 21ADD-023, Rept. EPA-650/2-74-009-g, GRU.9DJ.75, 72p., May 1975. 38 refs.*

NTIS: PB 243694/AS

An evaluation of the environmental impact of the BI-GAS Process of Bituminous Coal Research, Incorporated was performed. The process involves the steps of local preparation, gasification, quench and dust removal, shift conversion, acid gas removal, and methanation. The acid gas removal system removes sulfur compounds such as hydrogen sulfide and carbonyl sulfide as well as carbon dioxide via the proprietary Benfield process. It uses a hot solution of activated potassium carbonate in two separate absorber systems in series. The first of these produces an acid gas stream with a relatively high content of H2S which is sent to a Claus sulfur recovery plant. No specific emission problems are anticipated with this first scrubbing system. In a second step residual sulfur is removed together with most of the CO2, producing a gas stream which is discharged to the atmosphere. The sulfur content of the CO2 stream is 3400 ppm and will require additional processing to clean it up before release to the atmosphere.

53500 **APTIC NO. 77647**

Janssen, F. E., U. Bonne, R. H. Torborg, and A. N. J. Pearman

REDUCED POLLUTION THROUGH INCREASED SEASONAL EFFICIENCY OF RESIDENTIAL FURNACES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-09.2.)*

A computerized model was developed to compute the seasonal losses from a residential heating system. Results of measurements on gas-fired warm air systems agreed with the model predictions which revealed the relative importance of various losses. Major losses in efficiency were due to excess flue gas temperature, excess air, and off-period stack flow. Reducing burner capacity and excess air improved seasonal efficiency appreciably. Decreases in firing rate and excess air resulted in decreased nitrogen oxide emissions and unchanged carbon monoxide emissions. (Author conclusions modified)

53501 **APTIC NO. 78197**

Kachru, Rajinder P.

INCINERATION SYSTEM FOR CONTROLLING NOXIOUS ODORS IN A LAYER HOUSE. *Environ. Res., 9(3):342-348, June 1975. 7 refs.*

An incineration system for controlling noxious odors associated with poultry manure was developed. The odors consist primarily of mercaptans, sulfides, and diketones. Other components are volatile organic acids, indole, and skatole. A direct flame type incinerator is used, and all compounds present in the gas produced by the poultry manure are exposed to a consuming flame in a combustion chamber. This oxidizes the contaminants into harmless carbon dioxide and water vapor. Direct flame incineration is the most positive method of continuous elimination of the obnoxious odorous compounds.

53502 **APTIC NO. 78203**

Kamata, Hiroyuki and Takashi Tanaka

ELECTRIC DUST COLLECTING EQUIPMENT. (Denki shujin sochi). Text in Japanese. (Toa Kosan Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 50-18230. 3p., June 27, 1975. 2 refs. (Appl. Sept. 29, 1970, 1 claim).

An electric dust collector is described. The dust collector is cylindrical the outer cylinder enclosing two different sizes of cylinder. The middle cylinder is used as the anode, and the outer and inner cylinders are cathodes. The inner cylinder encloses a high voltage DC power supply to the ionization electrode located in the lower part of the dust collector. Air is sucked from the bottom of the dust collector with a blowing fan placed at the bottom of the collector ionizes the dust particles. As the air travels the dust collector through the spaces between the middle cylinder with the outer and inner cylinders, the charged particles are deposited on the middle cylinder. The dust collector can easily be disassembled by removing several connecting bolts. A large space is not required for the installation of the dust collector.

53503 **APTIC NO. 77709**

Kanowski, Siegfried and Robert W. Coughlin

CATALYTIC CONDITIONING OF FLY ASH WITHOUT ADDITION OF SO3 FROM EXTERNAL SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-66.4.)*

Experiments investigating the catalytic oxidation of sulfur dixode in flue gas to sulfur trioxide in sufficient quantity to achieve a substantial lowering of the fly ash resistivity are reported. Commercially available catalysts appear capable of converting concentrations of SO2 ranging from 200-1000 ppm in flue gas to SO3 which acts as a flue gas conditioner and enhances fly ash collection. The greater the concentration of SO2 in the flue gas the greater the concentration of SO3 produced. The moisture content of the gas can be increased from 9-17% without any effect on the conditioning; decreases in moisture to below 9%, however, adversely affect the conditioning. The effectiveness of the conditioning is also diminished by increasing the temperature of the flue gas. The residence time for the flue gas in the catalyst bed is 0.003 sec, about 270 times less than the 0.8 sec for a typical SO2 converter for sulfuric acid manufacture.

53504 **APTIC NO. 78093**

Kasagi, Ryoichi

GAS PURIFICATION DEVICE. *(Kitai no joka sochi). Text in Japanese. (Kasagi, Ryoichi (Japan)) Japan. Pat. Sho 50-22271. 4p., July 28, 1975. (Appl. Dec. 10, 1969, 1 claim).*

A gas purification device which comprises a long cylindrical body equipped with intake fan, auxiliary fans, high voltage electrode and liquid injector, through which the polluted gas is passed and pollutants are removed by centrifugal force similar to a cyclone is described. In the first stage, the crude particulates and concentrated gaseous pollutant portion separated by centrifugal force leave the cylinder through slits on the cylinder wall and enter the outer cylinder with a hopper device leading to the collector. The remaining micro- particulates and gaseous pollutants are removed in the second stage by the Cottrel-type attraction of electric charge and centrifugal force, where all particulates are charged and subsequently absorbed or adsorbed by water-containing surfactant or neutralizing agent injected into the cylinder forming a vortex liquid film.

53505 **APTIC NO. 78310**

Kato, Kazuyuki

MAINTENANCE OF MONITORING DEVICES FOR POLLUTION TREATMENT EQUIPMENT. *(Kogai shori sochiyo keiki no meintenansu). Text in Japanese. Puranto Enjiniya (Plant Eng.) 7(7):58-63, July 1975.*

Maintenance of monitoring devices for pollution treatment equipment at the Kasugai Plant of Oji Paper Manufacturing Co., Ltd., Japan, is described. There are 266 monitoring devices installed in the plant, comprising about 9% of the total equipment in the factory. About 10% of the regulatory devices in the plant are pollution-control related. Analyzers for sulfur dioxide gas, suspended solids, chemical oxygen demand dissolved oxygen, comprise about 40% of the total number of analyzers in use in the factory. The maintenance of monitoring devices is conducted by a department for monitoring devices, consisting of 28 persons, each of whom is familiar with both planning and maintenance. One to three years of on-the-job-training to become familiar with all the plant processes enable the personnel to work efficiently and competently. Monitoring devices are ranked in four orders of importance, and maintenance scheules are set up accordingly (from 1/3, 1/2, to 1-year checkups). Entries are made on inspection cards (punch cards) kept for each of the monitoring devices, and repairs are made from daily entries for malfunctions on breakdown cards. Monthly and yearly reviews of these cards, as well as performance tables, are used to evaluate the equipment. Two installations are described: one where planning and maintenance caused little trouble (OK-type stripping installation); one where there are still problems (clarifier), due to deficiencies in planning and maintenance. Overall, breakdown rate of treatment equipment decreased from 6% to 5% during a 3-year period.

53506 **APTIC NO. 78087**

Katz, J., J. R. Zarfoss, H. C. Dohrmann, R. L. Bump, E. L. Coe, Jr., and C. L. Martzoloff

INFORMATION REQUIRED FOR THE SELECTION AND APPLICATION OF ELECTROSTATIC PRECIPITATORS FOR THE COLLECTION OF DRY PARTICULATE MATERIAL. *J. Air Pollution Control Assoc., 25(4):362-368, April 1975. 10 refs.*

The selection and application of electrostatic precipitators for the collection of dry particulate material are discussed. A convenient and logical basis for comparing precipitators is the total collecting surface area and the amount of mechanical and electrical sectionalization. Precipitator performance is influenced by anything that alters the gas velocity and the electrical and physical properties of the particulate matter. There are process variables that influence the performance of a precipitator. Each of the following major variables is discussed to illustrate its influence and emphasize the need for accurate, complete information: gas flow rate, gas temperature, water content of the gases, chemical composition of gas and particulate matter, particulate concentration, particle size distribution, physical characteristics of the particulate material, and resistivity measurements.

53507 **APTIC NO. 78278**

Kawamura, Itsuo

TREATING AGENT FOR OFFENSIVE ODOR GAS. *(Akushu gasu shorizai). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50- 22991. 2p., Aug. 4, 1975. (Appl. Feb. 4, 1970, 1 claim).*

Agents for treating alkaline odor gases are described. The removal of alkaline odor gases is based on the neutralization effect between the treating agent and odor gas. The reagents developed are the superphosphoric acid mixed with zinc, sodium, potassium, iron, calcium, and magnesium or a combination of these metal additives. These mixed compounds are glass substances and their solution velocities in water is slow. Therefore the odor gases which pass through a column packed with the reagent could be effectively treated upon the addition of water. When water was added to the column, the reagent reacted with water to generate phosphoric acid which neutralized the alkaline gases. The generation of phosphoric acid can be controlled by the amount of water added to the column.

53508 **APTIC NO. 78014**

Kobylinski, Thaddeus P., Joseph J. Hammel, and Harold E. Swift

POROUS SILICA BEADS - A CATALYST SUPPORT FOR REMOVAL OF EXHAUST GAS POLLUTANTS. *Ind. Eng. Chem. Prod. Res. Develop., 14(3):147-150, Sept. 1975. 12 refs.*

Porous silica beads for use as a catalyst support for the removal of motor vehicle exhaust pollutants were fabricated by using low silica compositions and by carefully controlling heat treatment and leaching conditions. The porous beads were in the 1-5 mm size range and exhibited high pore volume as well as mechanical and thermal stability. A catalyst consisting of ruthenium supported on the porous silica beads proved to be a very active and selective device for the reduction of nitrogen oxides to nitroge;; it also exhibited a different reactivity toward carbon monoxide and hydrogen than that observed with ruthenium supported on alumina. Oxidation of CO was achieved at a lower temperature with platinum supported on the porous silica beads than that possible with platinum-alumina catalysts. (Author abstract modified)

53509 **APTIC NO. 78297**

Komeichi, Shigemitsu

POWER SUPPLY CONTROL DEVICE FOR ELECTROSTATIC PRECIPITATOR. *(Denki shujinkiyo dengen seigyo sochi). Text in Japanese. (Furukawa Mining Co., Ltd. (Japan)) Japan. Pat. Sho 50-16024. 4p., June 10, 1975. (Appl. May 14, 1971, 1 claim).*

In the existing thyrister type power supply control device, good wave form of DC output voltage, high operating voltage in regard to the sparking voltage, and safety against sparking short circuit are provided; however, the maximum voltage operation is not always realized in the case of automatic control by spark discharge frequency. To remedy such a disadvantage while maintaining advantages of the existing control device, a saturable reactor is used in place of inductance for damping. The modified power supply control device consists of two main current rectifying thyristers (controlled rectifier) in opposite directions placed on the low voltage AC side of the DC high voltage power supply for the electric precipitator, and a saturable reactor as current control device placed in series to the thyrister.

53510 **APTIC NO. 78270**

Kumagaya, Shigeto

DUST-CONTAINING GAS PURIFYING EQUIPMENT. *(Konjin gasu iyoka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-24743. 3p., Aug. 18, 1975. (Appl. Dec. 10, 1971, 1 claim).*

Purifying equipment for dust-containing gas is described. The equipment consists of three purifying sections connected in a series by a sucking fan. The flue gas enters the first purifying section which has water showers and several rooms in a series. The rooms are packed with activated carbon and iron chips. More than 90% of the chlorine gas in the flue gas is removed at this purifier. Some of the dust and soot from the flue gas was also removed. The flue gas proceeds to the second purifying section in which several metal screens of varying meshes and water showers are located. Tar and ash components in the flue gas are removed at the second purifier and the screen deposits are continuously removed by the water showers. The flue gas passes into the third purifier which is a cold washing purifier. The flue gas is cooled by cold air generated by a refrigerator. There are several curtains on which the cooled carbon monoxide, sulfur dioxide, and other components in the flue gas are deposited, and the deposits are removed by sprinkling water. The sprinkled water used in the purifiers is collected and purified for recirculation.

53511 **APTIC NO. 78149**

Kumazaki, M.

DESULFURIZATION METHOD BY SODIUM HYDROXIDE AND MAGNESIUM HYDROXIDE AND ITS OPERATIONAL ACHIEVEMENT. *(Kasei soda oyobi suisanka maguneshiumu ni yoru datsuryu hoho to sono untenjisseki). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 42(9):817-822, Sept. 1975.*

Flue gases at 220-260 C from two boilers (5 and 8 tons/hr) using C oil (S content 2.8-2.9%) were introduced to a desulfurization tower by a suction pump. Sodium hydroxide solution (30%) was pumped from a tank under the tower and sprayed to the flue gases in the tower in which the gas temperature was reduced to 100-110 C. Sulfur dioxide and dusts were removed by the washing solution. The resulting gas was passed through the tank to a mist separator and released from a stack. The washing solution entered the tank with the gas at a flow rate of 35 m/sec, and sodium sulfate concentration increased as the treatment proceeded. The solution in the tank was continuously pumped to a filter containing diatomaceous earth, and the regenerated solution was returned to the tank while NaOH was added to maintain the proper concentration. Results showed that more than 95% of SO2 and more than 90% of dusts were removed. Substitution of NaOH by magnesium hydroxide gave the same high desulfurization but lower running cost. The disadvantages of using magnesium oxide as the absorbent included its low solubility in water and the clogging of nozzles in the tower due to the magnesium sulfate formed.

53512 **APTIC NO. 78311**

Lamb, A. and E. L. Tollefson

CATALYTIC REDUCTION OF NITRIC OXIDE IN THE PRESENCE OF OXYGEN IN LOW CONCENTRATION HIGH VELOCITY GAS STREAMS. *Can. J. Chem. Eng., 53(1):68-73, Feb. 1975. 13 refs.*

A small fixed-bed catalytic reactor and a gas chromatographic analytical method were used to investigate the effects of oxygen on nitric oxide reduction by hydrogen over metal alloys. The rate of oxygen consumption was directly proportional to hydrogen concentration but independent of oxygen concentration, at oxygen and hydrogen partial pressures of 4 to 7 times 10 to the -3 power atm, and 1 to 11 times 10 to the -3 power atm, respectively, and space velocities of 43,000 to 45,000 per cu hr. The activation energy for the nickel-copper alloy used was 8.8 kcal-g per mole over a temperature range 347 to 502 C. In comparing nickel-copper and brass catalysts some selectivity in the reduction of nitric oxide in the presence of oxygen was observed. Depending on the conditions to which the nickel-copper alloy has been subjected, its activity at a given temperature was found to vary with time from one level to another. A solid alloy catalyst, containing copper and nickel, is effective for the reduction of nitric oxide by hydrogen in high velocity gas streams containing low concentrations of nitric oxide and oxygen. Such a catalyst may have potential use in the abatement of oxides of nitrogen in tail gas streams from nitric acid plants. (Author abstract modified)

53513 **APTIC NO. 77676**

Lamb, George E. R., Peter Costanza, and Bernard Miller

INFLUENCE OF FIBER PROPERTIES OF THE PERFORMANCE OF NONWOVEN AIR FILTERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.5.)*

The influences of fiber properties on the performance of nonwoven air filters were determined. Five geometric properties are considered: cross-sectional shape, linear density, surface roughness, crimp, and staple length. Two levels of each variable are represented in a set of polyester fiber samples. Nonwoven fabrics made from each of these fiber collections were used to filter fly ash particles from a stream of air. Efficiency is improved by the use of trilobal rather than round cross-section fibers with no detrimental effect on drag. Efficiency and drag are both improved by the use of crimped rather than uncrimped fibers. Efficiency is improved through the use of three denier rather than six denier fibers, but at the cost of increased drag. Improvements are most pronounced for the filtration of fine particles. (Author abstract modified)

53514 **APTIC NO. 78190**

Masai, Tadahisa

EXHAUST GAS PURIFICATION METHOD FOR AN INTERNAL COMBUSTION ENGINE. *(Nainen kikan haigasu joka hoho). Text in Japanese. (Hitachi, Ltd. (Japan)) Japan. Pat. Sho 50-25082. 5p., Aug. 21, 1975. (Appl. Nov. 30, 1971, 1 claim).*

Incompletely oxidized components such as hydrocarbons and carbon monoxide are produced primarily on the combustion chamber wall in a layer of 0.05 mm thickness. The thin layer formed along the wall containing incompletely oxidized components is separated from the exhaust gas in the center of a cylinder which is discharged directly into the exhaust pipe. The separated thin layer portion is recirculated into the intake pipe. The thin gaseous layer is collected with the upward motion of the piston in the concave space formed between piston and cylinder wall, and discharged from the outlet pipe located at the upper part of the cylinder or on the cylinder head, equipped with an extraction valve, and connected to the intake pipe. The CO and HC concentrations are reduced by recirculation, while the nitrogen oxides concentration is also reduced by the effect of the temperature drop of the combustion gas caused by the addition of recirculated gas.

53515 **APTIC NO. 78170**

Matson, D. D.

HOW TO REDUCE EXCESS SULPHUR IN THE KRAFT LIQUOR CYCLE. *Pulp Paper Can., 76(C):47-50, March 1975. (Presented at the Canadian Pulp and Paper Association, Annual Meeting, 60th, Technical Section, Montreal, Quebec, Jan. 29-Feb. 1, 1974.)*

The reduction of excess sulfur in the kraft liquor cycle at the Northwood Pulp and Timber Ltd., is discussed. Efforts to reduce salt cake losses in the effluent and to minimize sulfur emissions create an excess of sulfur in the liquor cycle. A sodium S balance is performed predicting that an excess of 9.3 lb of S/adt of pulp occurs. Five methods to reduce this excess by lowering the S input from the spent acid of the chlorine dioxide generation are described. The economics of each choice are presented. Cascading the present Mathieson generator with an SVP unit is the best route to overcome the excess S input. (Author abstract modified)

53516 **APTIC NO. 75933**

McCain, Joseph D.

EVALUATION OF CENTRIFIED SCRUBBER (FINAL REPORT). *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-1480, Program Element 1AB012, ROAP 21ADL-004, Rept. EPA-650/2-74-129-a, SORI-EAS-75-334, 31p., June 1975.*

NTIS: PB 243626/AS

The particulate collection efficiency of an Entoleter Incorporated Centrifield Scrubber was determined by Environmental Protection Agency Method 5 techniques on a source producing particulates with a mass mean diameter of about 100 micron. The efficiencies ranged from 99.50-99.73% for this particle size over two days of testing. Measured fractional efficiencies were 90% at 0.03 micron, 50% at 0.05 micron, 20% at 0.1 micron, 50% at 0.5 micron, 90% at 1 micron, and 99.7% at 5 micron. The Centrifield Scrubber was not substantially different than other conventional-type scrubbers in terms of its efficiency. (Author conclusions modified)

53517 **APTIC NO. 78258**

Miki, Takao and Yoshiaki Asayama

AUTOMOBILE EXHAUST GAS PURIFIER. *(Jidosha yo haiki gasu jyoka sochi). Text in Japanese. (Mitsubishi Electric Co., Ltd., Himeji (Japan)) Japan. Model Util. Sho 50-25860. 2p., Aug. 2, 1975. (Appl. Feb. 3, 1971, claims not given).*

A device which controls the opening of the throttle valve in the carburetor during high-speed deceleration is described. The device has a diaphragm which regulates the position of the throttle valve stopper. The diaphragm is connected to a vacuum line in which a magnetic valve is installed. The magnetic valve is controlled by a running speed sensor. At high speeds, the magnetic valve closes the vacuum line, thereby allowing maximum engine brake action. However, when the speed is too low, the magnetic valve does not close the vacuum line, so that the throttle valve does not close completely during deceleration.

53518 **APTIC NO. 78259**

Miki, Takao

AN EXHAUST GAS PURIFIER FOR AN INTERNAL COMBUSTION ENGINE. *(Nainen kikan no haiki gasu joka sochi). Text in Japanese. (Mitsubishi Electric Co., Ltd., Himeji (Japan)) Japan. Model Util. Sho 50-20187. 2p., June 19, 1975. 1 ref. (Appl. July 20, 1970, claims not given).*

A device which controls catalyst temperature in internal combustion engines equipped with a catalytic converter is described. At high speeds, the increased temperature of the exhaust gas is sensed by a temperature sensor installed at the catalyst bed in the exhaust pipe. The sensor regulates the control valve for passage of excess air to the catalyst bed. When thhe valve is open, the excess air from an air pump is passed through the catalyst bed, thus decreasing the catalyst temperature. When the exhaust gas temperature is low, the sensor closes the control valve, preventing the flow of the excess air to the catalyst bed. The device controls the upper temperature limit in the catalyst bed, which increases the life of the catalyst and produces the maximum catalytic effect.

53519 **APTIC NO. 78186**

Miwa, K.

ODOR AT FOOD PLANTS AND ITS DISPOSAL TECHNOLOGY. *(Shokuhin Kojo ni okeru akushu mondai to sono shori gijutsu). Text in Japanese. Japan Fudo Saiensu (Japan Food Sci.), 14(4):67-76, April 1975. 4 refs.*

Odor control for food processing facilities is discussed. Control methods considered include: scrubbing with water and weak acid or alkali, chlorine treatment, oxone oxidation, masking, adsorption, direct combustion, catalytic oxidation, wet-type electric dust collection, oxidation by soil bacteria, and the conversion of hydrogen sulfide into thiosulfuric acid at oil refineries. Data on odors at food processing factories due to boiling, drying, and loss of freshness are given. Cleaning by water costs less, is widely applicable, but requires considerable maintenance and effluent control. Chlorine treatment is rarely practiced in Japan. The operating cost of ozone oxidation is low, the equipment is easy to operate, the method also sterilizes; it may be combined with some other method like combustion, masking, or adsorption. Masking may be adopted when the odor is localized and when it is less intensive. Adsorption is also widely applicable; the equipment is simple and effective for a small gas volume but requires periodical change or rejuvenation of chemicals. Direct combustion is good for odors arising from inflammable components. There must be over 18% oxygen in the waste gas. Running costs can be high unless waste heat is utilized. An inexpensive catalyst of zeolite contact oxidation methods was recently developed by the Hokkaido Industrial Experiment Station. Electric dust collecting system construction is expensive, and requires much space; the running cost is low, however, and the method is effective for noninflammable gas. The effluent, however, is still odorous.

53520 **APTIC NO. 78023**

Miyamoto, Masaki

DESULFURIZATION OF THE EXHAUST GAS WITH ZEOLITE SYNTHESIZED FROM DIATOMACEOUS EARTH. *(Noto keisodo no zeoraito-ka ni yoru haien datsuryu ni kansuru kenkyu). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(4):28, July 1975.*

Both A type and X type zeolites were prepared from the diatomaceous earth of the Noto Peninsula in Ishikawa Prefecture, and the prepared zeolites were tested for use in flue gas desulfurization. The direct preparation of zeolite from the diatomaceous earth (without the fusion process) was employed. Several diatomaceous earths of known chemical compositions were mixed to obtain a desired molar ratio of silicates, whose maturation was achieved in two steps; room temperature maturation and reflux maturation by heating. If the second maturation was carried out for more than 12 hr, the X type zeolite formation was low. At the best conditions, 80% pure zeolite could be prepared for both types according to their X-ray diffraction spectra. The synthesized X type zeolite adsorbed sulfur dioxide more efficiently than A type zeolite. When a simulated flue gas containing 680 to 840 ppm sulfur dioxide was passed at a flow rate of 9.0 Nl/min through a 250 g zeolite column, the column breaking time (defined as the time required for the SO2 concentration of the column effluent to reach 10% of the initial SO2 concentration) was 5.3 hr, while that for the commercial zeolite and activated carbon was 6.8 hr and 8.0 hr respectively. Moisture in the flue gas interfered with the SO2 adsorption by zeolite, and moisture adsorbed more strongly than SO2. If the flue gas contained more than 1% moisture, the adsorbed water reacted with SO2 and the zeolite crystal tended to break down. The use of zeolite for flue gas desulfurization was more costly than the use of activated carbon.

53521 **APTIC NO. 78196**

Mizuno, Hideyuki

ENVIRONMENTAL POLLUTION COUNTERMEASURES TAKEN BY JAPAN CASTING AND FORGING CORPORATION. *(Waga sha no kogai taisaku ni tsuite (Nippon Chu Tanko KK)). Text in Japanese. Chuko To Tanko (Cast Forg. Steel), no. 265:27-29, Aug. 1975.*

Pollution countermeasures taken at the Kitakyushu plant of the Japan Casting and Forging, KK, formed in 1970 primarily as a subsidiary of Shin Nippon Steel, KK, are described. Inspection of soot emissions and waste water, and waste disposal are handled by the parent company. Bag filters, LPG fuel, coolant water recirculation, and lavatory waste water purification tanks are utilized. The major topic at present is dealing with the policies of the Kitakyushu City Pollution Control Administration. In Kitakyushu City, concentrations of sulfur dioxide and nitrogen oxides exceed environmental standards. Any plant expansion must be accompanied by a drastic reduction in pollutant emissions, and improvement in waste water quality. A suitable furnace, together with a change from burning heavy oil A to light oil by the end of the expansion period, will reduce total NOx emissions by 10%. By 1978, a 30% reduction is projected. Since 1973, heavy oil A (sulfur content, 0.9%), has been used in accordance with an agreement negotiated with the city. Projected use of light oil (sulfur content, 0.02%) should reduce SOx emissions by 95%. Collection of soot from electric furnaces by electrostatic precipitators is under study. Improvement of water quality includes maintaining pH of waste water at specified levels, even the ph of discard water pumped up from subterranean sources.

53522 **APTIC NO. 78290**

Mizutori, Takehiko, Kazuhito Tate, Masao Iguchi, Tamotsu Nagai, Yoshihito Satomi, Yoshito Kaneko, Harumi Kagaya, Kiyohiko Inaba, Saburo, Ohnishi, and Reizaburo Nishiyama

MODIFICATION METHOD FOR CATALYTIC SUPPORT. *(Shokubai tantai no kairyoho). Text in Japanese. (Researching and Developing Assoc. of Heavy Oil Direct Desulfurization (Japan)) Japan. Pat. Sho 50-22992. 3p., Aug. 4, 1975. 1 ref. Appl. May 29, 1970, 1 claim).*

In the hydrogenation desulfurization of petroleum fractions, the most important physical factor of catalytic support affecting the catalytic activity is the pore structure, particularly the pore diameter. For the desulfurization of sulfur compounds with smaller average molecular weight, contained in the light fraction, the alumina with pore diameter of ca 30 Angstrom is suitable, while the alumina with pore diameter of ca 110-140 Angstrom is suitable for S compound with higher molecular weight contained in residual oil. The pore diameter of alumina was varied in the range of ca 30-300 Angstrom, without decreasing the specific surface area, by adding a suitable amount of nitric acid, phosphoric acid or sulfuric acid to alumina gel prior to the calcination at 400-700 C.

53523 **APTIC NO. 78223**

Moriguchi, Mitsuhisa, Yukio Nozaki, Hiroshi Abe, and Hiroshi Yamamoto

REMOVAL METHOD FOR NITROGEN OXIDES IN THE EXHAUST GAS. *(Haigasu chu chisso sankabutsu shokyoho). Text in Japanese. (Nippon Kokan Kabushiki Kaisha (Japan)) Japan. Pat. Sho 50-23664. 4p., Aug. 9, 1975. 2 refs. (Appl. Dec. 22, 1970, 1 claim).*

Nitrogen oxides, primarily nitric oxide, are removed from combustion exhaust gas by reacting with ammonia at temperatures above 500 C with removal rate of more than 90% (NO). Reaction mechanisms are as follows; 4NH3 + 6 NO equals 5N2 + 6H20, 2NO2 equals 2NO -O2 and N204 equals 2NO2. The removal rate of NO increases with increase in reaction temperature and amount of NH3 added. Liquid NH3, gaseous NH3, gas containing NH3, liquid containing NH3 and compounds containing NH3 which readily release gaseous NH3 in reaction atmosphere can be used as NH3 sources. To facilitate the reaction of NOx and NH3, the reactor used is equipped with an internal or an external heater for maintaining reaction temperature above 500 C and some obstacles made of fire bricks for increased catalytic effect and mixing effects.

53524 **APTIC NO. 78226**

Moriguchi, Mitsuhisa, Hiroshi Abe, Akira Saito, and Makoto Miyazawa

REMOVAL METHOD FOR NITROGEN OXIDES IN EXHAUST GAS. *(Haigasuchu no chisso sankabutsu no jokyo hoho). Text in Japanese. (Nippon Kokan Kabushiki Kaisha (Japan)) Japan. Pat. Sho 50-24268. 7p., Aug. 14, 1975. (Appl. Feb. 12, 1973, 2 claims).*

The removal method presented here for nitrogen oxides by liquid-gas catalytic reaction in the presence of oxidation-reduction agent is particularly suitable for the treatment of a large quantity of combustion exhaust gas such as is the case for thermal power plants and other large scale industries. The NOx is converted to nitrate of alkali metal when reacted with alkali absorption solution containing oxidation-reduction agents such as water soluble quinones (sodium naphthoquinone sulfonate or sodium anthraquinonedisulfonate) with pH adjusted to 10-12 by adding sodium hydroxide. The alkali metal nitrate obtained is recovered as carbonate or oxide of alkali metal by calcinating in the presence of carbon or carbon monoxide, while converting the nitrate group into nitrogen. The alkali salts recovered are recirculated as material for alkali absorption solution, while gaseous product containing N2 and NOx is recirculated to the absorption reaction tower, where unabsorbed N2 is discharged from the system. The oxidation-reduction agent is oxidized with air and recirculated as material for alkali absorption solution. This reaction system is a closed system, and removal rate of NOx is approximately 68%.

53525 **APTIC NO. 78253**

ON THE CONVERSATION RECORD OF THE PREVENTION OF NITROGEN OXIDES AND STACK GAS DENITRATION. *(Chisso sankabutsu no boshi to haien dasho ni kansuru zadankai kiroku). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 42(9):823-845, Sept. 1975.*

Research conducted at the Osaka Prefectural Research Institute revealed that nitrogen oxides were reduced to about 50 ppm by a combination of two-stage combustion and flame division techniques. A self-bias atomizer was used at the Borukano Co. for NOx reduction. Atomizers of large volume and small volume were alternately arranged. Up to 35% NOx reduction was achieved by this method. It was also found that the NOx concentration was lower at 1% oxygen than at 3% O2. A combination of bias combustion, two-stage combustion, and exhaust gas recirculation reduced more than 50% of the NOx. Catalytic reduction by ammonia was employed by the Unichika Co. for simultaneous reduction of NOx and sulfur dioxide at a relatively low temperature (200-250 C). At a space velocity of 1200/hr, more than 90% reduction of approximately 300 ppm NOx and 1000 ppm SOx was achieved with a special catalyst. Burners using off-gas which contained mainly hydrogen and methane was used for a cracking furnace, and NOx was reduced from more than 100 ppm to 20-30 ppm. Analysis of NOx by the chemiluminescence method was also discussed.

53526 **APTIC NO. 77719**

Netzley, Arthur B.

CONTROL OF ASPHALT SATURATORS BY FILTRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-66.7.)*

High efficiency aerosol filtration techniques for controlling dense white particulate emissions from asphalt saturators and other line machinery associated with the manufacture of asphalt roofing materials and building paper are reviewed. Examples of two types of filtration systems are given. A moving, bonded, glass-fiber mat is used on one system for filtration at velocities in excess of 1000 ft/min. The filter mat is followed by an entrainment separator to collect fine oil droplets which are entrained by the high velocity effluent leaving the surface of the glass-fiber mat. The other type of system consists of a fixed, unbonded, glass-fiber mat for filtration at low velocities of 10-30 ft/min. A prefilter is used to remove large solid particulates. Emissions tests conducted on four high- velocity, moving, glass-fiber filtration systems controlling emissions from four separate asphalt saturators demonstrate collection efficiencies ranging from 88-94%. The opacity of emissions varies from 0-15% white and is directly related to the filtration temperature. (Author abstract modified)

53527 **APTIC NO. 78269**

Nishinomiya, Torazo and Takao Teranishi

AUTOMATIC CHOKE DEVICE FOR CARBURETOR. *(Kikaki no outo choku sochi). Text in Japanese. (Hitachi, Ltd. (Japan)) Japan. Pat. Sho 50-20203. 4p., July 1975. (Appl. March 1, 1972, 1 claim).*

The automatic choke device of the carburetor was modified so that the opening of the choke and throttle valves can be adjusted properly with temperature variation. Design objectives are improvement in reliability of choke performance and automotive exhaust emission control. The system comprises a temperature detector for converting temperature variation into mechanical output, a fast idle adjustment mechanism for adjusting throttle valve opening according to the output signal, a pair of metal parts with a stopper for determining the choke valve opening actuated by temperature detector output and piston mechanism connected to the throttle valve axle and used for opening the choke valve at full simultaneously with rapid rotation of the abovementioned axle.

53528 **APTIC NO. 77675**

Noll, Kenneth E. and Wayne T. Davis

THE GENERATION AND EVALUATION OF FABRIC FILTER PERFORMANCE CURVES FROM PILOT PLANT DATA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.6.)*

The basic relationship between pressure drop variations with time and various dust/fabric combinations was determined in a systematic study on two test facilities. Performance curves show that the pressure drop during the early stages of the filter cycle depends on both the fabric structure and the dust characteristics. The residual pressure drop of conditioned fabrics is also a function of the fabric and dust. A performance curve which shows a large rate of increase in pressure drop during the initial cake formation on a clean fabric has the potential for a high residual pressure drop for the conditioned fabric. After a homogeneous cake has formed on a filter, further increase in pressure drop is a function of the dust characteristics only, as would be predicted by application of Darcy's law. This applied to both a clean and conditioned fabric. The collection efficiency for fabrics appears to be related to pressure drop, with higher efficiencies associated with fabrics demonstrating lower pressure drops. The thicker all-spun anf felted fabrics have performance curves with lower pressure drops and significantly higher removal efficiencies than the filament or combination fabrics. (Author abstract modified)

53529 **APTIC NO. 78201**

Nozaki, F., T. Uematsu, and T. Hashimoto

STUDIES ON URANIUM OXIDES CATALYSTS FOR NO-REMOVING PROCESS. *(NO Jokyo purosesu no tameno sanka uran kei shokubai ni kansuru kenkyu). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), no. 2:85-89, 1975. 5 refs.*

Uran oxide (U3O8) as a catalyst for nitric oxide reduction by caron monoxide or ammonia was compared with other catalysts. The reaction on NO reduction by CO decreased in the order of CuCr2O4-CuO, U3O8, Fe2O3 and Pt(0.5%)-Al2O3. Addition of Cs2O at Cs/U+Cs of 0.1-0.3 resulted in higher NO conversion, with the highest conversion rate being obtained at Cs/U+Cs equals 0.2 and the reactivity being increased 4-5 times. Results of additions of other alkaline and alkaline earth metals showed that the effect decreased in the order of cesium, potassium, sodium, calcium, and magnesium. The reactivity on NO reduction by NH3 decreased in the order of Pt(0.5%)-Al2O3, CuCr2O4-CuO, U3O8 and Fe2O3. Uran oxide also showed higher reactivity on NO reduction by NH3 than V2O5, which showed no reactivity on the NO reduction by CO but considerable reactivity on that by NH3.

53530 **APTIC NO. 78207**

Odanaka, Akira, Yoshio Horie, Mitsuru Idohara, and Naomichi Kosaka

ADSORPTION AGENT. *(Kyuchakuzai). Text in Japanese. (Nippon Soda Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 50-18474. 2p., June 28, 1975. 1 ref. (Appl. Dec. 23, 1970, 1 claim).*

An adsorption agent for the removal of heavy metals and their compounds from waste gases or liquids is described. Commercial urea resin can be used as the adsorption agent if it were treated with alkaline or acid solution depending upon the acidity of the waste gases or liquids. However, the adsorption agent shows greater adsorptivity for alkaline samples. The adsorption agent can be used in a stationary or mobile bed or can be put in a column for continuous purification of waste gases or liquids. The agent can also be used in a batch operation in which the adsorption agent is dumped into a cell containing the waste gases or liquids. In the continuous purification technique, the ideal flow rate of samples through the agent was 5 to 15 m/min for gas treatment and 2 to 30/min space velocity for liquid treatment. The agent can take up 5 to 30% of the resin weight in the adsorption of mercury and its compounds. When commercial urea resin was used, it was soaked in 1N potassium hydroxide solution overnight and then rinsed with water until the pH reached to 10. Ten grams of this treated urea resin was then packed in a 50 mm glass column with a 15 mm diameter, into which the solution containing 10 ppm mercury (II) chloride flowed with a space velocity of 5/min. The Hg concentration of this effluent was 0.09 ppm.

53531 **APTIC NO. 78200**

Ohyama, Norishige

FUEL-AIR MIXTURE HEATING DEVICE. *(Kongoki kanetsu sochi). Text in Japanese. (Hitachi, Ltd. (Japan)) Japan. Pat. Sho 50-25090. 5p., Aug. 21, 1975. (Appl. Dec. 22, 1971, 3 claims).*

In the automobile engine, the fuel-air mixture is heated for the purpose of reducing the toxic components in exhaust gas. However, at an optimum temperature range of 100-115 C for complete vaporization of fuel, the charging efficiency is reduced, which results in the decrease in engine output by 10-20%. Such shortcomings are remedied in the heating device of this invention. In the carburetor, a heating pipe with a metal net placed inside and a jacket containing water and connected to a pipe leading to exhaust pipe where water is heated, an adiabatic pipe with venturi and cooling pipes with jackets containing liquid such as alcohol (with a boiling point lower than that of water) and connected to a condensation pipe leading to the inlet of the carburetor where the liquid is cooled by the heat of vaporization of fuel are connected in series. The vaporized fuel at high temperatures in the heating pipe is led through the venturi, where the higher boiling fraction with higher specific gravity is gathered in a flow passing through the center of pipe, while the lower boiling fraction and air are pushed into a flow passing along the pipe wall. In the cooling pipe, the temperature of the lower boiling fraction is lowered without causing condensation, and the fuel-air mixture is injected into the combustion chamber in the state of supersaturation, thus preventing the decrease in engine output.

53532 **APTIC NO. 78192**

Omori, Kurato

SUMMARY OF THE COMMENDED ENVIRONMENTAL POLLUTION CONTROL EQUIPMENT--FROM THE OFFICIAL COMMENDATION SYSTEM FOR SUPERIOR ENVIRONMENTAL POLLUTION CONTROL EQUIPMENT IN 1975 BY THE JAPAN SOCEITY OF INDUSTRIAL MACHINERY MANUFACTURERS. *(Hyosho sareta kogai boshi sochi no gaiyo-Nippon Sangyo Kikai Kogyokai no Showa 50-nendo yushu kogai boshi sochi hyosho seido yori). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 4(9):82-86, Sept. 1975.*

Six commended pieces of pollution control equipment, developed by medium-to small-sized enterprises (capital less than 3.3 million dollars; or having less than 1000 workers), are described. The sludge dryer, developed by Okawara Seisakusho, KK, is a rotating dryer, with a heat blower and a stirring mechanism installed inside the drum. Material of high water content (80-90%), such as feed, fertilizer, regenerated material and fill, is dried and pelletized for easy handling. The heat conduction factor is 200-500 kcal/cu m-hr- C, and equipment is compact. Sudak, developed by Sanko Seisakusho, KK, is a small-sized dust collector. Dust-contaminated air is passed through a pre-duster chamber which collects coarse dust particles, then passed through 7-14 layers of needle-punched felt, which filter out the dust. When the fan stops, a vibrator automatically operates for a set time to shake the dust from the filters into a dust case for collection. Kanpeko-Press, developed by Taiyo Tekko, KK, uses hydraulic oil pressure to smash empty cans. The machinery is comparatively small and portable. Nafuko-type electrostatic dust collector, developed by Nafuko Gijutsu, KK, consists of alternating layers of discharge plates with discharge needles (0.2 mm long) on the ends, and dust collector plates. Good corona discharge occurs, and materials such as lead oxide and lead sulfate, which have high electrical resistance, can be collected easily. The initial cost is 20-30% lower than the Cottrell, and operating costs are also lower. The liquid combustion-type waste liquid treatment installation developed by Nittetsu Kakoki KK treats waste liquids by direct heat-exchange. High-temperature combustion gas, after combustion at the burner, is sprayed into liquid, and sudden-cooling heat exchange is effected by the direct contact between gas and liquid. This process is suitable for recovery of hydrogen chloride in the manufacture of vinyl chloride monomer. Wet-type stack gas desulfurization installation, developed by Riken Koki KK, is a small-sized installation for removal primarily of sulfur oxides and soot. The absorbent liquid for the pollutants is sprayed out of a rotating drum through specially-designed nozzles, and comes into contact with the soot and sulfur dioxide. A high pollutant removal rate, without use of catalyst or condensing agent, is possible. The main parts of the machinery are standardized and unitized for easy maintenance and low construction costs, and durability is good.

53533 **APTIC NO. 78073**

Pendergast, John J., Willis D. Ison, and William H. Sutherland

WET AUGER: RESPIRABLE DUST CONTROL FOR UNDERGROUND AUGER CONTINUOUS MINING MACHINES. *Coal Mine Health and Safety, Norton, Va. and Washington, D. C., Mining Enforcement and Safety Administration Informational Rept. 1013, 11p., 1975. 1 ref.*

A water transfer mechanism was developed to reduce the high level respirable dust concentrations produced by auger type continuous mines to the 2.0 mg/cu m (milligrams of dust/cu m of air) standard. Water passes from the stationary miner through the hollow core of the rotating augers to spray nozzles installed on the augers. This through auger spray system reduces the average respirable dust concentrations of the returnside jacksetter and the milligrams of airborne respirable dust generated from each ton of coal produced, by more than 60%. (Author abstract modified)

53534 **APTIC NO. 77893**

Ponder, Wade H. and Roger C. Christman

THE CURRENT STATUS OF FLUE GAS DESULFURIZATION TECHNOLOGY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 22 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-64.7.)*

Current and developing technologies for the removal of sulfur oxides from power plant stack gases by physical and chemical means are described. For convenience of discussion, these flue gas desulfurization (FGD) technologies are divided into two categories: nonregenerable processes which produce a waste product and regenerable processes which produce a salable product. The current commercial application status of processes in both categories is presented. While several FGD processes are being demonstrated at full-scale, development activities in both major categories continue. Three major goals of the nonregenerable development efforts are improvement of lime and limestone scrubbing systems, development of environmentally sound sludge disposal methods, and development of the double alkali scrubbing process. Ten regenerable FGD processes are described, including an activated carbon process, an aqueous carbonate process, an ammonia process, the Citrate process, and a phosphate process. All have been successfully operated at the pilot or prototype scale. Costs for building and operating FGD processes are given, and the role of FGD processes in meeting national air quality goals is discussed. (Author abstract modified)

53535 **APTIC NO. 78062**

Raymont, M. E. D.

ROLE OF HYDROGEN IN CLAUS PLANTS. *Hydrocarbon Process., 54(5):177-179, May 1975. 16 refs.*

The role of hydrogen as a component of Claus plant gas streams is discussed. A number of commercially available tail gas clean up processes require the reduction of tail gas sulfur values to hydrogen sulfide prior to clean up treatment. The presence of hydrogen, which is required for the reduction step, is thus beneficial to the process. The concentration of hydrogen exiting from the furnace depends on a number of variables including the concentration of hydrogen containing species in the feed, the stability of the pre-flame region, the heat transfer from the flame to the pre-flame region, the furnace temperature and residence time, the flame zone reactions, and the quench temperature gradient. Free molecular hydrogen levels in Claus plants are generally close to those predicted for equilibrium conditions. Hydrogen beneficially acts in a partially catalytic role by increasing the rate of hydrogen sulfide oxidation. Hydrogen is also able to reduce carbonyl sulfide and carbon disulfide reaction products. Additionally, hydrogen appears capable of reducing catalyst sulfation levels.

53536 **APTIC NO. 77744**

Ritter, R. E.

TESTS MAKE CASE FOR COKE-FREE REGENERATED FCC CATALYST. *Oil Gas J., 73(36):41-43, Sept. 8, 1975. 12 refs.*

Modifications of the petroleum cracking process that increase the efficiency of catalytic cracking catalysts also reduce emission of carbon monoxide. The full potential of zeolite-containing catalytic cracking catalysts can be effectively used only if all residual carbon is removed from the catalyst during regeneration. High-temperature regeneration causes the coke deposited on zeolytic catalytic cracking catalysts to drop to low levels. But residual carbon remains primarily on the catalyst-cracking site. Operating the regenerator to remove as much of this carbon as possible is essential to obtaining the full zeolite selectivity of the catalyst. This should result in improved gasoline and coke selectivity at the expense of light olefin yields, with some penalty in gasoline octanes. These yield-shifts are identical with the shifts obtained with increased catalyst- zeolite content. Therefore, the octane/olefin losses can be offset by changes in unit operation similar to the changes made to handle higher zeolite activities, including higher reactor temperatures. Higher regeneration temperatures reduce carbon monoxide pollution by rapidly converting carbon monoxide to carbon dioxide, while increasing the efficiency of the cracking process by reducing the carbon-on-regenerated-catalyst (CRC) to lower levels.

53537 **APTIC NO. 77781**

Robinson, B.

REDUCING THE HAZARD. *Gas Eng. Manage. J. Inst. Gas Engrs., vol. 15:227-240, Aug. 1975. 3 refs. (Presented at the Midland Journal Gas Association, Oct. 30, 1973.)*

Current practices in reducing the hazards in uncontrolled venting of gas to atmosphere are discussed. Preventive action such as gas conditions is practiced to maintain joint sealing materials, either yarn or rubber, in something approaching their original conditions. Humidification is applied basically to achieve constant dewpoint conditions as a means of avoiding drying out and deterioration of yarn in lead run joints. Oil fogging deals with mechanical joints by providing the opportunity for the rubber joint to maintain its earlier swollen state which was created by absorption of liquid hydrocarbons from town gas. Remedial action includes several methods of joint repair such as jute swellant for treating lengths of main and encapsulation for treating individual joints.

53538 **APTIC NO. 77660**

Robinson, John W.

WET SCRUBBER APPLICATION TO HOGGED FUEL BOILERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-34.2.)*

The use of wet scrubbers for controlling particulate emissions from two tangentially-fired gas boilers burning hogged wood or southern pine bark fuel is described. The installation consists of two scrubbers mounted in parallel on each of two stacks. The scrubbers utilize centrifugal force by sharply changing the direction of gas flow to impinge dirty gas on the water surface to capture particulate matter. The total cost of the scrubber installation is $50,000. The measured particulate emission rate for each stack is 7.4 lb/hr; and, based on an average inlet dust loading of 250 lb/hr, the overall efficiency is estimated to be 97%.

53539 **APTIC NO. 78070**

Rosenberg, H. S., R. B. Engdahl, J. H. Oxley, and J. M. Genco

THE STATUS OF SO2 CONTROL SYSTEMS. *Chem. Eng. Progr., 71(5): 66-71, May 1975. 9 refs.*

The status of sulfur dioxide control systems was determined in a seven point program. The program comprises these tasks: survey the installations in North America now using SO2 control devices; establish an information and analysis center for information on stack gas control; prepare topical reports on subjects of importance to members of the group; survey overseas installations of SO2 control devices; conduct laboratory studies on problems related to stack gas pollution control: contact vendors of SO2 control devices to obtain information on operating experience; and conduct review meetings. The processes that are currently in use include: lime/limestone processes; three alkali process modes--no regeneration, calcium regeneration, and thermal regeneration; magnesium oxide scrubbing; and catalytic oxidation. Only the Paddy S Run facility of Louisville Gas and Electric which uses limestone scrubbing comes closest to meeting the National Academy of Engineering requirements that proven industrial acceptability of an SO2 removal process is one in operation on a 100 MW or larger unit for more than 1 yr. The fact that the Paddy s Run facility is only 65 MW may not be a significant difference.

53540 **APTIC NO. 77827**

Rossnagel, W. B.

SAFETY REQUIREMENTS AND PERFORMANCE CONSIDERATIONS FOR ELECTROSTATIC PRECIPITATORS INSTALLED ON ORGANIC EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-20.1.)*

Rates and removal efficiencies for wet and dry electrostatic precipitator systems used for collecting particulates and organics (hydrocarbons, ketones, alcohols, aldehydes, and organic acids) are presented based on field tests at textile manufacturing plants, surface coating operations, and chemical processing plants. The removal efficiencies range from 58-99% for inlet grain loadings of between 0.0354-0.348 grains/standard cu ft. Outlet grain loadings range from 0.0082-0.076 grains/standard cu ft. Most of the systems provide adequate reduction in visual and odorous emissions even though the efficiencies are less than those usually specified. Safety considerations for operating frequently sparking electrostatic precipitators handling organic emissions are also discussed.

53541 **APTIC NO. 78227**

Saegusa, Kinichi

PURIFICATION METHOD FOR EXAUST GAS CONTAINING CARBON MONOXIDE. *(Issanka tanso o fukumu haigasu no jyokaho). Text in Japanese. (Saegusa, Kinichi (Japan)) Japan. Pat. Sho 50-23379. 3p., Aug. 7, 1975. 2 refs. (Appl. Oct. 24, 1970, 1 claim).*

In the purification method for exhaust gas from various furnaces and automobiles, the carbon monoxide is removed by catalytic oxidation. For the preparation of catalyst carrier with high porosity (50%), large surface area and less flow resistance (pressure loss 4 cm water/sq cm, cm 200 nitrogen/min), a mixture consisting of carborundum or/and alundum, carbon (when calcined leaves pores in the carrier) and inorganic binder is molded into desirable shapes (plate, cylinder, pellet) and calcined at 1100-1300 C for 24 hr. As catalysts, mixtures consisting primarily of ferric oxide and small amounts of oxide of manganese, chromium, nickel, alkali metal or/and alkali earth metal are suitable from the standpoint of stability and production cost. The carrier obtained is immersed in a catalyst solution, dried at 100 C for 20 min and calcined in an electric furnace at 850 C for 10 min. The catalyst produced are effective for the oxidation of CO in the temperature range of 300-800 C, and therefore particularly suitable for automotive exhaust gas. In the case of Fe2O3 catalyst, the removal rate of CO was 100%, while that of chromium oxide catalyst was 66%.

53542 **APTIC NO. 78339**

Saleta, Lubos

THE USE OF METALLIZED ACTIVATED CARBON FOR FLUE GAS DESULFURIZATION. *(Pouziti metalizovaneho aktivniho uhli pro odsirovani plynu). Text in Czech. Chem. Prumysl (Prague), 25(2):67-69, 1975. 2 refs.*

A 270 mm thick layer of iron-metallized activated carbon was used as the last filter stage in a long-term desulfurization test of an industrial gas which is used in the manufacture of carbon dioxide and which contained a concentration of hydrogen sulfide that varied between 100 and 800 mg/cu m. The test was conducted at a pressure of 1 to 3 atm and a sorbent temperature of 60-80 C. The sorbent load was 300 l of gas/l sorbent/hr. During the first 5000 hr of operation the desulfurization capacity of the activated carbon was a minimum of 90%. Over the next test interval which extended from 5000 to 10,000 hours, the sorptive activity decreased linearly with increasing time to almost zero. Comparable results were also obtained under laboratory conditions.

53543 **APTIC NO. 77731**

Schneider, Alan M.

COST EFFECTIVENESS OF GASOLINE VAPOR RECOVERY SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-54.1.)*

The cost effectiveness of the blower system of controlling hydrocarbon vapors was compared to the balance system in San Diego and other cities with similar air pollution problems. Estimates of the cost of these two methods, and of the potential level of control obtainable by each, are made. From these estimates, a cost effectiveness ratio is computed. The blower system is the more expensive of the two, but it is capable of capturing more of the hydrocarbon losses. The costs for controlling a ton of hydrocarbons with the blower system are lower than those of other control options open to San Diego, specifically the automobile retrofit tactics and transportation management tactics. Every ton of hydrocarbons controlled by the blower system allows cutting back on some more costly method. Despite its greater cost, the blower system is the preferred approach. (Author abstract modified)

53544 **APTIC NO. 78157**

Schwartz, Lewis B. and Melvin Lieberstein

EFFECT OF RAPPING FREQUENCY ON THE EFFICIENCY OF AN ELECTROSTATIC PRECIPITATOR. *Water Air Soil Pollut., 4(3/4):343-353, July/Aug. 1975. 3 refs.*

The rapping frequency of the collector plates and discharge wires of a single stage Wheelbrator precipitator was varied in a manner intended to produce optimum precipitator performance. Particulate emissions were measured at both the precipitator inlet and outlet by Environmental Protection Agency-Office of Air Pollution (EPA-OAP) and American Society of Mechanical Engineers (ASME) sampling trains and at the precipitator outlet by continuous sampling and recording equipment. There is a reduction in particulate emission rate at the outlet of the precipitator resulting from a reduction in rapping time of the collector plates and a decrease in the frequency of rapping of precipitator collecting plates. The performance of an electrostatic precipitator is affected by a variation in rapping frequency of the precipitator collector plates and to a lesser extent the discharge wires. (Author abstract modified)

53545 **APTIC NO. 75929**

Shannon, L. J., D. E. Fiscus, and P. G. Gorman

ST. LOUIS REFUSE PROCESSING PLANT: EQUIPMENT, FACILITY, AND ENVIRONMENTAL EVALUATIONS (FINAL REPORT). *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1324, Program Element 1AB013, ROAP 21AQQ-010, Task 4, Rept. EPA-650/2-75-044, 121p., May 1975. 1 ref.*

NTIS: PB 243634/AS

Field test results from an evaluation of the St. Louis refuse processing plant are presented. The processing plant along with an electric power plant is part of St. Louis-Union Electric Refuse Fuel Project. About 80% of the incoming municipal refuse is converted to refuse fuel, on both a mass and an energy basis. Plant operating and maintenance costs range from $2.58 to $14.80/ton of refuse processed. Particulate emissions from a hammermill cyclone are less than 0.01 grains/standard dry cu ft, and those from an air classifier cyclone average 0.209 grain/ standard dry cu ft. Over 80% by weight of these particles possess a mean diameter greater than 10 micron. (Author abstract modified)

53546 **APTIC NO. 77875**

Shaw, Nathan R.

VAPOR ADSORPTION TECHNOLOGY FOR RECOVERY OF CHLORINATED HYDROCARBONS AND OTHER SOLVENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-12.3.)*

Vapor adsorption technology for the recovery of chlorinated hydrocarbons and other solvents is reviewed. Topics covered include: recovery plant design and operation, industrial applications, and types of solvents to be recovered. A typical activated carbon adsorption system which consists of a blower and/or solvent-laden air pickup system, dual carbon beds, a solvent vapor condenser, and either a decanter or solvent distillation section for final treatment of the recovered solvent is illustrated. Solvent-laden air is forced through one carbon bed, while the other is being regenerated; thus, the system can be operated on a 24-hour/day basis. The design of industrial vapor adsorption recovery systems is usually controlled by the amount of solvent laden air to be handled and not by the rate of solvent recovery. Most deep-bed vapor adsorption systems possess recovery capacities in excess of those required for typical applications.

53547 **APTIC NO. 78000**

Shimizu, Katashi

REDUCTION OF SULFUR CONTENT AND ENERGY CONSERVATION. *(Tei iouka to sho enerugi). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(7):580-584, July 1975. 6 refs.*

Various desulfurization methods and the percentage of total energy consumed by them are described. During 1974, the heavy oil desulfurization capacity in Japan was about 1 million barrels/day, of which about 75% was indirect desulfurization, and the remainder, direct desulfurization. This capacity was about 18% of the total crude oil treatment capacity. Calculations for direct desulfurization of the Kuwait oil residue (sulfur content, 4.0%), 40,000 barrels/day, to heavy oil (sulfur content, 0.3%), excluding the naphtha fraction, results in an energy loss of 5-10%. Wet-type stack gas desulfurization methods are said to have energy expenditures of about 2%. However, if 3% fuel consumption (requiring low-sulfur fuel) in the afterburner is assumed, actual energy consumption can become quite high. Heavy oil decomposition consumes large amounts of oxygen, and forms carbon dioxide, which results in an energy loss, but almost sulfurless clean fuel is produced. Direct burning of crude oils has been increasing, but problems arise because the supply of middle-distillate oils is reduced. Use of light oils presents similar supply problems. More than 10% of the energy supply could be consumed in the production of light oil in sufficient supply. Energy conservation by heavy oil desulfurization includes modifying processes to reduce hydrogen consumption, setting up heat exchangers, and installing a power recovery turbine. Such a turbine can recover 500 kW of a pump motor power expenditure of 1500 kW, for 40,000 barrels/day raw material.

53548 **APTIC NO. 77803**

Siepman, R. R. and K. Reith

CATALYTIC GAS CLEANER FOR SMALL PLANTS. *(Depuratore catalitico di gas per piccoli impianti). Text in Italian. Inquinamento, 17(5):47-50, May 1975.*

A catalytic cleaner that can be economically operated in small plants (gas discharge up to 1000 N cu m/hr) is described. The unit includes a burner, a metal plate mixer, and a regulating device. Total pressure loss is so small that in many cases the discharge gas pressure is sufficient to overcome the unit s resistance, and an additional ventilator is not necessary. The units as designed can be geometrically grouped to ensure maximum, uniform participitation of the surface area of the pipes during the reaction. The unit has been used in varnishing, glass, plastics, food smoking, and food and fodder drying operations.

53549 **APTIC NO. 77681**

Simon, Herbert and John E. Williamson

CONTROL OF FINE PARTICULATES FROM CONTINUOUS MELTING REGENERATIVE CONTAINER GLASS FURNACES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-30.6.)*

Four successful methods of reducing particulate emissions from continuous melting regenerative container glass furnaces are described and test data are presented. Both baghouse and electrostatic precipitator abatement systems eliminate visible plumes completely and reduce mass emission rates 65-90%. A venturi scrubber has similar collection efficiency, but numerous breakdowns. The scrubber has a steam plume which is esthetically undesirable. Two gas fired furnaces without abatement equipment are described that reduce emissions by modification of batch and operating parameters to achieve compliance with stringent emission limits. Test data are presented on an electric container glass melting furnace which has a lower particulate emission mass discharge rate than any other furnace tested. (Author abstract modified)

53550 **APTIC NO. 78076**

Sisti, D. C.

SULFUR REMOVAL AT THE BEAVER CREEK CONSOLIDATED COAL CO S STINSON PLANT. *Trans. Soc. Mining Engrs. AIME, 258(2):95-97, June 1975. (Presented at the Society of Mining Engineers, Fall Meeting, Pittsburgh, Pa., Sept. 1973, Paper 73F345.)*

A technical evaluation of actual performance of the preparation facilities at Beaver Consolidated Coal Co s Stinson plant is presented. Special emphasis is placed on sulfur reduction in 1 1/2 by 3/8 in., 3/8 by 28 mesh, and 28 mesh by 0 size fractions. The heavy medium section of the plant is evaluated and the treatment of the 28 mesh by 0 coal is discussed. Design criteria are summarized for sizing and selection of equipment required to process 1 3/4 million type of raw coal on coals of divergent washability characteristics. (Author abstract modified)

53551 **APTIC NO. 77873**

Snow, Richard H., James E. Huff, and Werner Boehme

CONTROL OF RENDERING PLANT ODORS BY WET SCRUBBERS: RESULTS OF PLANT TESTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 3 refs. (Presented at the Air Polution Control Association, Annual Meeting, 68th. Boston, Mass., June 15-20, 1975, Paper 75-12.5.)*

A three-stage laboratory scale countercurrent packed bed scrubber and a full-scale horizontal spray scrubber were employed to evaluate the effect of different scrubbing liquid combinations and operating conditions on the control of rendering plant odors during actual plant tests. Both types of scrubbers were very effective in reducing rendering odors, with the most efficient scrubbing combination being multiple stages of alkaline sodium hypochlorite. The percent odor removal for the laboratory scrubber with alkaline hypochorite was as high as 99.9 (odor panel evaluation), while that for the plant scrubber using the same scrubbing medium was as high as 96%. Experimental data were collected to develop scrubber performance models.

53552 **APTIC NO. 77741**

Sondreal, E. A. and P. H. Tufte

COMPARISON OF FLUE GAS DESULFURIZATION FOR EASTERN VS. WESTERN U. S. COALS. *Trans. Soc. Mining Engrs. AIME, 258(2):122-123, June 1975. 2 refs. (Presented at the Society of Mining Engineers Fall Meeting, Acapulco, Mexico, Sept. 1974. Paper 74F322.)*

Flue gas desulfurization for eastern versus western United States coals is compared. Flue gas desulfurization is easier to achieve and less costly when burning western coals. Western coals cannot generally be burned in compliance with Federal and state new source emission standards without some degree of control. Coal cleaning for removal of sulfur is not commercially practiced on western coals, which typically contain half organic and half pyritic S. A sulfur dioxide removal of 30 to 40% is required to meet the Federal emission standard of 1.2 lb SO2/million Btu at the average 0.7% S content of western coals, while 70-90% would typically be required for eastern and central coals. Throwaway flue gas desulfurization processes are favored over salable product processes for the western coal because of the remoteness from markets and the availability of land for sludge disposal. Wet scrubbing with lime or limestone is closest to proven commercialability and lowest in cost. Approximately 40% of this alkali is available for reaction in a wet scrubber and 30-70% of SO2 removal can be achieved under simulated power plant conditions using fly ash as the source of alkali.

53553 **APTIC NO. 78013**

Sooter, Matthew and Billy L. Crynes

PRELIMINARY ASSESSMENT OF CATALYST PORE SIZE EFFECTS ON SULFUR REMOVAL FROM A

COAL DERIVED LIQUID. Ind. Eng. Chem. Prod. Res. Develop., 14(3):1991204, Sept. 1975. 14 refs.

A change in the average pore size radius of a cobalt-molybdate on aluminum catalyst from 33 to 25 A result in a loss in desulfurization capability while hydroprocessing raw anthracene oil, a coal derived liquid. Either a change in the intrinsic surface activity or restriction in reactant molecular orientation for proper adsorption and surface reaction were proposed as possible phenomena acting to limit the samll pore catalysts. An evaluation of the sulfur content of the liquid product fractions suggested that the intrinsic activity of the catalyst did not change. (Author abstract modified)

53554 **APTIC NO. 77678**

Spitz, Albert W.

CONTROL OF EMISSIONS FROM SECONDARY METALS RECOVERY AND ASPHALT PAVING PLANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-30.7.)*

Typical emission control systems, installed within the last 5 yr for brass, bronze, and aluminum ingot makers, secondary copper, lead, and zinc smelters, and asphalt paving plants are reviewed. For a Cu based ingot maker, a water spray and dilution air cooling system is used with a baghouse. Fumes from a Zn alloy recovery furnace are controlled with a baghouse with a calcium carbonate precoat. The pollution potential of Al scrap processing is described along with several solutions. The use of precoated houses in the secondary Al industry is increasing. Pilot scale trial installations are recommended. Asphalt paving plant pollution control systems are under revision with pulse jet baghouses replacing wet scrubbers.

53555 **APTIC NO. 77930**

Stephens, N. Thomas, J. Martin Hughes, Bruce W. Owen, and William O. Warwick

EMISSIONS CONTROL AND AMBIENT AIR QUALITY AT A SECONDARY STEEL PRODUCTION FACILITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975. Paper 75-15.3.)*

A case study of dust and fume emission control measures and their impact on ambient air quality in the surrounding area is presented for a secondary steel production facility using electric arc furnaces. Emission control measures include a mechanical cyclone and a number of baghouses with side draft hood evacuation. Measurement of the ambient air quality near the plant with high-volume samplers indicate that the impact of the facility on the surrounding community is minimal, with mean particulate concentrations near the plant differing little from those recorded in a nearby residential area. Visible emissions, however, are still a source of complaint from local officials. The most difficult problem is emission control during charging; the predominant furnace in use is a top-charged type which releases fume emissions when the roof is off during charging.

53556 **APTIC NO. 78173**

Swift, P.

WET DEDUSTING: DESIGN AND APPLICATION. *Chem. Eng., no. 295:146- 150, March 1975.*

The design and application of wet dedusting techniques are reviewed. Principal types of wet dedusters in use are packed irrigated towers, irrigated porous beds, mechanically induced spray wet dedusters, irrigated cyclones, self-induced spray wet dedusters, and venturi scrubbers. Wet dedusting is confined to those applications where its advantages are real and give a satisfactory performance for the investment made. It is used less as a substitute for fabric filters in applications where they later can function effectively with the probability of virtually 100% collection efficiencies.

53557 **APTIC NO. 77838**

Swift, W. M., G. J. Vogel, and A. F. Panek

POTENTIAL OF FLUIDIZED-BED COMBUSTION FOR REDUCING TRACE-ELEMENT EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-46.3.)*

The potential of fluidized-bed combustion for reducing trace element emissions as compared with conventional coal combustion systems was evaluated using a bench scale, 6-inch diameter, pressurized, fluidized-bed combustor. Overall mass balances for the elements lead, cobalt, iron, potassium, lanthanum, sodium, and scandium possessed material balances of 100 + or - 10%, indicating essentially no losses of these elements by volatilization. Retention of the relatively volatile elements mercury, fluorine, bromine, and arsenic indicated a definite potential for the reduction of emissions of these elements via fluidized-bed combustion. Concentrations of trace elements in coal and fly ash samples from successive stages of gas cleaning devices (primary cyclones, secondary cyclones, and filters) were adjusted to a combustible-matter-free basis and compared for significant differences in concentration between coal and ash samples and for successively finer samples of ash. The concentrations of elements such as barium, cobalt, lanthanum, antimony, scandium, and tantalum showed slight tendencies to increase with decreasing particle size. The lower combustion temperatures of fluidized-bed combustion were apparently effective, however, in reducing the preferential concentration of trace elements in the finer ash particles. (Author abstract modified)

53558 **APTIC NO. 78092**

Takizawa, Shinobu and Yasuhiro Kobayashi

CARBURETOR. *(Kikaki). Text in Japanese. (Toyo Kogyo Co., Ltd. (Japan)) Japan. Pat. Sho 50-23460. 4p., Aug. 7, 1975. (Appl. Sept. 10, 1971, 1 claim).*

A carburetor modified to reduce nitrogen oxides in automotive exhaust gas is described. The NOx content is reduced with the increase in fuel-air ratio. Therefore, the fuel-air mixture with a fuel-air ratio higher than the optimum ratio for engine operation is used for the reduction of NOx. However, the hydrocarbon and carbon monoxide in exhaust gas are increased with the increase in fuel-air ratio. This carburetor supplies a fuel-air mixture of higher than the optimum ratio. The choke valve opening is increased at temperatures above the set value for the purpose of reducing CO and HC formation. The choke valve opening is controlled by the choke lever connected to the bimetal and a device for rotating the bimetal, which is controlled by the argument diaphragm, the diaphragm for normal engine operation, and the thermoswitch.

53559 **APTIC NO. 78097**

Takizawa, Shinobu and Yasuhiro Kobayashi

CARBURETOR. *(Kikaki). Text in Japanese. (Toyo Kogyo Co., Ltd. (Japan)) Japan. Pat. Sho 50-20206. 8p., July 12, 1975. (Appl. Sept. 10, 1971, 1 claim).*

For the purpose of reducing the emission of toxic components such as hydrocarbons and carbon monoxide, a carburetor was designed to maintain minimum air-fuel ratio required at the time of engine starting. It comprises a carburetor for primary intake with an automatic choke valve which opens in full at relatively warm temperatures (20 C) and an auxiliary carburetor used during the period of engine starting and warming with auxiliary choke valve which opens when normal engine operation is attained, an auxiliary throttle valve which opens during cranking and closes after normal engine operation is attained and a fuel injection nozzle located at the venturi between the auxiliary choke valve and auxiliary throttle valve. The valve opening and closing are controlled by an electric circuit connected to the three-way solenoid valve, timer, and key switch.

53560 **APTIC NO. 78191**

Takizawa, Shinobu and Yasuhiro Kobayashi

CARBURETOR. *(Kikaki). Text in Japanese. (Toyo Kogyo Co., Ltd. (Japan)) Japan. Pat. Sho 50-20205. 5p., July 12, 1975. (Appl. Sept. 10, 1971, 1 claim).*

A carburetor designed to maintain the air-fuel ratio at the required minimum at the time of engine starting to reduce hydrocarbons and carbon monoxide in exhaust gas is described. In the starter chamber of the auxiliary fuel supply system, the fuel from the float chamber and the air from the upper part of the carburetor body are mixed and supplied to the intake pipe through the conduit through an opening immediately below the throttle valve at the time of engine starting. The starting valve in the starter chamber is controlled by the diaphragm activated by the negative pressure in the intake pipe and the conduit connecting the starter chamber and the intake pipe is closed at a set time after normal engine operation is attained by the solenoid valve placed in the conduit which is actuated by the timer. The carburetor is also equipped with an automatic choke valve which opens in full at temperatures above the set value.

53561 **APTIC NO. 78266**

Takizawa, Shinobu and Yasuhiro Kobayashi

CARBURETOR. *(Kikaki). Text in Japanese. (Toyo Kogyo Co., Ltd. (Japan)) Japan. Pat. Sho 50-20204. 6p., July 12, 1975. (Appl. Sept. 10, 1971, 1 claim).*

A carburetor with a bimetal type automatic choke was modified for the purpose of reducing the emission of toxic components such as hydrocarbons and carbon monoxide due to the incomplete combustion caused by excessively low air-fuel ratio. The bimetal temperature is set at 20-25 C, and during engine cranking at an environmental temperature lower than the bimetal set temperature, the choke valve is closed completely, which provides combustion gas with an air-fuel ratio of 1 to 2. After the starting of the engine, the choke is opened at a certain angle (e.g., 20 deg) by negative pressure in the intake pipe regardless of environmental temperature or bimetal set temperature. At an environmental temperature higher than the bimetal set temperature, the choke opening is further increased, which provides combustion gas with a higher air-fuel ratio (7-13). By this mechanism, the feeding of combustion gas with an unnecessarily low air-fuel ratio can be avoided, thus reducing emission of CO and HC.

53562 **APTIC NO. 78091**

Tamura, Zensuke, Takao Hishinuma, and Norio Arashi

FLUE GAS DESULFURIZATION METHOD AND EQUIPMENT. *(Haigasu datsuryu ho to sochi). Text in Japanese. (Hitachi, Ltd. (Japan)) Japan. Pat. Sho 50-23383. 4p., Aug. 7, 1975. 1 ref. (Appl. July 29, 1970, 2 claims).*

A desulfurization method and its equipment, based on adsorption on activated carbon and subsequent washing with water, were modified for the better temperature control of flue gas and utilization of flue gas as a heat source for concentrating the sulfuric acid obtained. The flue gas from a combustor such as a boiler is led into the adsorption tower packed with activated carbon, where sulfur dioxide is adsorbed, oxidized to sulfur trioxide by oxygen, and removed as H2SO4 by washing with water. A part of the flue gas is led through the heating units to concentrate the diluted H2SO4 and returned to the main flue, where the temperature of the flue gas is adjusted to 100-150 C before entering the adsorption tower. This increases adsorption efficiency, length of adsorbent life, and safety. The temperature is adjusted by regulating the flow rate through the heating units. At least three adsorption towers are used, in which adsorption on a dry adsorbent, the washing process, and adsorption on a wet adsorbent are carried out simultaneously in a different tower. The treated flue gas is passed through these three towers and mixed before discharging in order to maintain the temperature at 100 C or higher for better dispersion in the air.

53563 **APTIC NO. 78026**

Tanada, Seiki and Yoshihito Boki

ADSORPTION CHARACTERISTICS OF METHYL MERCAPTAN ON VARIOUS ADSORBENTS. *(Jakkan kyuchakyu zai ni taisuru methyl mercaptan gas no kyuchaku tokusei ni tsuite). Text in Japanese. Preprint, Japan Society of Pharmacy, Tokyo, p. 125, 1975. (Presented at the Japan Society of Pharmacy, Annual Meeting, 95th, Nishinomiya, Japan, April 4-6, 1975.)*

A vacuum apparatus equipped with a spring balance made of quartz was used to determine the amount of methyl mercaptan adsorbed on silicate, active carbon, and zeolite at 20 and 30 C. The adsorbents were heated at 110 C for 1 hr in a vacuum before the adsorption measurement was made. The heat of adsorption was calculated by the Clausius-Clapeyron equation from the isotherms at 20 and 30 C. The amount of methyl mercaptan adsorbed was largest with magnesium silicate of all the silicates tested and with the synthetic zeolite, F-9, of all the zeolites tested. The amounts were 78.30 and 104.00 mg/g, respectively. The amount of methyl mercaptan adsorbed on active carbon was very large. The best active carbon adsorbed as much as 205.60 mg/g. This amount was almost twice that for magnesium silicate of zeolite. Adsorption on active carbon and magnesium silicate was the Freundlich type. The adsorption on zeolite was of the Langmuir type and was monomolecular. The heats of adsorption on magnesium silicate, synthetic zeolite (F-9), and on active carbon were: 10-30, 30-55, and 4-6 kcal/mole, respectively. Active carbon was the most suited for the removal of methyl mercaptan.

53564 **APTIC NO. 78229**

Taniguchi, Noboru

SOOT AND DUST TREATMENT DEVICE FOR INCINERATOR. *(Nenshoro no baijin shori sochi). Text in Japanese. (Hyuga Kogyo K. K. (Japan)) Japan. Pat. Sho 50-22734. 6p., Aug. 1, 1975. 3 refs. (Appl. Feb. 2, 1971, 1 claim).*

The soot and dust treatment device for incinerators was modified for high efficiency removal of particulates, deodorization, and disposal of particulates collected. In four horizontal particulate separators connected in series and equipped with a suction system, the steam produced by utilizing the combustion heat in the incinerator is sprayed so that a spiral flow of steam is created for maintaining turbulence. As the combustion gas is drawn to the particulate separator by the suction system, the air required for combustion is supplied to the incinerator. The suspended particulates are adsorbed on the steam particles and removed from the flue gas. The water drops with adsorbed particulates are collected in a tank, and particulates are separated by a series of filters. The filtrate is recirculated to the steam spray system.

53565 **APTIC NO. 77823**

Teller, A. J.

TURBINE EMISSION CONTROL - A SYSTEMS APPROACH. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-03.2.)*

A systems approach to the control of exhaust emissions from stationary gas turbines is described. An integral emission control system consisting of a laminar boundary augmenter to reduce total gas flow, a low-energy scrubber to recover particulates at low pressure drop, and a water recycle system was tested on a 17,000 lb thrust jet engine test cell for 3 yr. The control system reduced opacity to less than 10%, and the particulate emissions from the system were 0.003 grains/standard cu ft. Utilization of the boundary flow augmenter allowed for reducing the size of the emission control system by 40% from original projections. (Author abstract modified)

53566 **APTIC NO. 78228**

Tsushima, Yoshio and Muneo Honsho

WET TYPE STACK GAS DESULFURIZATION METHOD AND ITS EQUIPMENT. *(Shishiki haien datsuryu hoho narabini sochi). Text in Japanese. (Mitsubishi Kakoki Kaisha, Ltd. (Japan)) Japan. Pat. Sho 50-23382. 5p., Aug. 7, 1975. 1 ref. (Appl. Nov. 30, 1970, 2 claims).*

The wet type desulfurization method for flue gas described here is based on the absorption by alkali solution (sodium hydroxide). The absorbent solution containing sodium sulfate and sodium thiosulfate accumulated during regeneration and recirculation processes is purged and dried, producing powdered product consisting primarily of sodium sulfite. The sulfur dioxide is absorbed in an alkali solution that is sprayed in an absorption tower equipped with mist collector, packed shelves and dust filter. The absorbent solution is recirculated until saturated with SO2, and then led to the heater and regeneration tower, where sodium bisulfite is decomposed to Na2SO3, SO2, and water, repeating the process until SO2 concentration becomes sufficiently high. Then the H2O vapor and SO2 are led to the SO2 recovery system. The concentrated solution of Na2SO3 and Na2S2O3 with precipitated Na2SO3 crystals is led to the filtration system. Crystals obtained are dissolved in a solution containing NaOH, sodium carbonate and Na2SO3 (if necessary), and the Na2SO3 solution obtained is recirculated to the absorption tower. The filtrate containing accumulated Na2SO4, and Na2S2O3 is purged and dried by hot air flow. The powder product obtained consists primarily of Na2SO3.

53567 **APTIC NO. 78077**

Vasan, S.

THE CITREX PROCESS FOR SO2 REMOVAL. *Chem. Eng. Progr., 71(5):61-65, May 1975.*

The Citrex process for the removal of sulfur dioxide from stack gases is discussed. Citrex reaches higher SO2 removal efficiencies (of the order of 95%) and lower SO2 level (about 25-50 ppm in the treated gas) at a lower investment and operating cost, as compared to a throwaway technique like the limestone process. The Citrex process produces as by-product 0.5 lb of elemental sulfur/lb of SO2 removed. This could either be marketed or easily stored without environmental hazards. The limestone process produces nearly 16 times the amount, or about 8 lb of sludge/lb SO2 removed, that has to be stored on a long term basis. Economic benefits of the Citrex process over the limestone process include lower L/G requirements (7.0 vs. 100); lower pressure drop and pumping requirement; 25% lower investment costs; 40% lower power requirements; and 15-25% lower annual capital and operating costs.

53568 **APTIC NO. 77666**

Walton, John W., Ernest C. Koontz, and Jerel R. McInnis

AIR POLLUTION IN THE WOODWORKING INDUSTRY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-34.1.)*

High volume stack samplers were used to make field evaluations of particulate emissions from cyclones serving wood-fired boilers used in woodworking operations. Most woodworking cyclones were found to be below 20% equivalent opacity. Cyclones having higher visible emission levels generally contained sanding dust. A grain loading standard based on the high volume sampler method appeared to be the best method for regulating the woodworking industry because of the numerous problems associated with accurately establishing process weight inputs.

53569 **APTIC NO. 77876**

Wiley, Samuel K.

HYDROCARBON EMISSIONS FROM CHEMICAL LOADING OPERATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-12.2.)*

Methods for controlling hydrocarbon emissions during the loading of petrochemicals into enclosed transporting vessels are reviewed. Both flaring and incineration are effective in refineries and petrochemical plants, although the former method is limited to cases where the vapor stream contains sufficient heat to allow ignition of the hydrocarbons. Incineration can be used in conjunction with an inert, saturated, or diluted collection system. Vapor recovery by condensation or absorption of the gas to return it as a liquid product is also commonly used. A simple chemical vapor recovery system for a barge loading terminal is illustrated.

53570 **APTIC NO. 75941**

Wright, Charles H.

SULFUR AND NITROGEN BALANCES IN THE SOLVENT REFINED COAL PROCESS (FINAL REPORT). *Pittsburg and Midway Coal Mining Co., Merriam, Kans., Office of Coal Research and Environmental Protection Agency Interagency Agreement EPA-IAG-D4-0454, Program Element 1AB013, ROAP 21ADD-025, Task 1, Rept. EPA-650/2-75-011, 147p., Jan. 1975. 3 refs.*

NTIS: PB 243893/AS

An elemental balance for a solvent refined coal process was conducted with a laboratory reactor to determine the fate of sulfur and nitrogen in the process. The work was performed with Kentucky Number 9 high volatile B bituminous coal and a blend of processed anthracene oils under 1000 psig hydrogen pressure. Material recovery was between 98 and 99%. The SRC process removed nearly all of the ash, most of the sulfur, and less of the nitrogen from coal. Accounting for nitrogen from the raw data was awkard because output exceeded input. The removal of an appreciable fraction of the nitrogen may require liquefaction under conditions that convert all material to hydrocarbons of appreciably lower weight than is usual for current SRC processes. (Author conclusions modified)

53571 **APTIC NO. 78279**

Yamada, Hiroshi and Katsuyuki Takahashi

DUST COLLECTING EQUIPMENT FOR THE ADHERED DUST WITHIN THE DUST COLLECTOR. *(Shujinki ni okeru fuchaku funjin datsurakudoki no funjin hoshu sochi). Text in Japanese. (Hitachi Plant Engineering and Construction Co., Ltd., Tokyo Japan)) Japan. Pat. Sho 50-24740. 3p., Aug. 18, 1975. (Appl. Oct. 30, 1971, 1 claim).*

A device for collecting re-suspended dust adhered within the dust collectors during its disadhering operation is described. A compressed air flow is blown perpendicularly to the end of the exit duct of the dust collector. Thus the dust suspended in the air flow is removed by the compressed air flow. The compressed air flow exits from the opposite side of the exit duct and it travels to the entrance of the dust collector. The generation of the compressed air flow is synchronized with the removal of adhered dust from the dust collector. The device can be installed in most conventional dust collectors including electroprecipitators.

53572 **APTIC NO. 78369**

Yokota, S. and T. Hisatomi

NISSAN ANTI-POLLUTION SYSTEM. *(Nissan jidosha no 50 nen haiki gasu taisaku sisutemu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(8):787-795, Aug. 1975.*

The anti-pollution systems developed for Nissan President, Sedllic, and Gloria are described. In the President model, an electronically-controlled fuel injection system is used to reduce the carbon monoxide, hydrocarbon, and nitrogen oxides emissions by means of low fuel-air ratio. A catalytic converter is used to reduce CO and HC emissions, an exhaust gas recirculation system is used for the reduction in NOx, and an activated carbon adsorption device is used for the removal of vaporized fuel. In the Sedllic and Gloria models, the secondary air injection system and catalytic converter are used for the reduction of HC and CO emissions, an exhaust gas recirculation system is used for the reduction in NOx, and an activated carbon adsorption device (canister type) is used for the removal of vaporized fuel. In both cases, the engine bodies were modified to maintain engine performance and fuel cost at the existing level.

53573 **APTIC NO. 78315**

Yuki, Toru

SUBARU EXHAUST EMISSION CONTROL BY ENGINE MODIFICATION (SEEC-T) SYSTEM. *(Enjin modifikeshon ni yoru gasorin enjin sha no haiki gasu taisaku (SEEC-T) shisutemu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(8):781-786, Aug. 1975.*

Subaru exhaust emission control (SEEC-T) system by engine modification, developed by Fuji Heavy Industries, KK, Japan, is described. Automotive exhaust is purified without installation of special after treatment equipment, such as thermal reactors and catalytic converters. Emissions meet 1975 and 1976 standards for Japan, and 1975 standards for the United States. The engine uses a lean-burn mixture (A/F, up to 17). By introduction of secondary air through an air suction valve (ASV), complete fuel combustion is facilitated, and formation of carbon monoxide, hydrocarbon is suppressed. Combustion temperatures are maintained suitably high, by means of double-action distributor to control ignition timing; lengthening time of stay of exhaust in the cylinder to promote oxidation; and use of port liner to maintain high exhaust temperatures. Stainless steel is used for the exhaust pipe, and a pre-muffler and a main muffler are part of the pipe. In order to decrease the maximum combustion temperature to decrease NOx emission, the following features are included: Aluminum engine and bathtub-type combustion chamber are used for their good characteristics. Suitable compression ratios, double-action distributor, and overlap valve timing to recirculate part of the exhaust internally are also utilized. In comppany-operated 10-mode tests on SEEC-T automobile (1400 cc engine), emissions were as follows (1976 standards): CO, 1.9 (2.1); HC, 0.15 (0.25); nitrogen oxides 0.55 (0.6).

53574 **APTIC NO. 77843**

Zahedi, K. and J. R. Melcher

ELECTROFLUIDIZED BEDS IN THE FILTRATION OF SUBMICRON PARTICULATE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 24 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.8.)*

The use of an electrofluidized bed (EFB) consisting of fluidized particles with an imposed electric field in either the flow direction (co-flow) or perpendicular to the flow direction (cross-flow) as a high performance particulate control device is discussed. By dint of the electric field, the bed particles (whether conducting or insulating) sustain positive and negative charges on their respective ends. Experiments are described for the co-flow configuration used to collect 0.7 micron DOP particles. A slug-flow model is developed showing the way in which efficiency depends on unfluidized bed height, bed-particle size, particulate mobility, gas flow-rate and applied electric field intensity. This model is successfully correlated with tests in which flow rate, bed particle size, and unfluidized bed height are varied. Efficiencies better than 90% can be achieved in collecting 0.7 micron DOP with a gas residence time less than 50 msec and a pressure drop of about 6 cm of water. (Author abstract modified)

53575 **APTIC NO. 77849**

Environmental Protection Agency, Cincinnati, Ohio, Office of Research and Development

USE OF COAL MINE REFUSE AND FLY ASH AS A ROAD BASE MATERIAL. *In: NERO 74 Annual Report. EPA-670/9-75-002, p. 46-49, March 1975.*

Two coal-related waste products, fly ash and coal mine refuse, were tested as a road base material. The coal mine refuse serves as the load-bearing aggregate, while fly ash is used to fill the voids between the refuse to increase stability and to neutralize any acidity produced from the pyritic refuse material. The leachate from the mixtures of refuse and fly ash and of refuse and fly ash plus lime do not constitute an environmental problem during the first 10 mo following construction. The coal refuse alone produces an undesirable discharge and is not an environmentally acceptable road base. After 10 mo, the structural characteristics of the base materials are satisfactory for use in specific situations where its applicability must be determined on an individual bases. (Author conclusions modified)

53576 **APTIC NO. 77984**

Environmental Protection Agency, Washington, D. C., Office of Mobile Source Air Pollution Control

TEST RESULTS ON A 1975 CALIFORNIA VEGA EQUIPPED WITH THE GOULD DUAL-CATALYST EMISSION CONTROL SYSTEM. *8p., May 1975.*

The test vehicle was a 1975 two door sedan produced in compliance with the 1975 California vehicle emissions standards. Exhaust emissions were controlled by a catalyst system employing three catalyst beds. The first bed removed oxygen and provided early cold start-up hydrocarbon and carbon monoxide oxidation. The second bed reduced nitrogen oxides. Secondary air was injected into the exhaust gas after the second bed to provide sufficient oxygen for oxidation of the remaining hydrocarbons and carbon monoxide in the third bed. Adjustments in the engine operation are described. The testing consisted of the 1975 Federal Test Procedure and the Environmental Protection Agency Highway cycle. Both of these tests are conducted on a chassis dynamometer and employ the constant volume sampling procedure. The fuel used was Indolene unleaded gasoline. The hydrocarbon and carbon monoxide emissions were well within the statutory 1978 standards. The nitrogen oxides emissions of .42 grams per mile slightly exceeded the statutory 1978 standard of 0.4 grams per mile. The ability of this system to approach the statutory 1978 standards and still maintain fuel economy, coupled with the relative simplicity of the system and its compatibility with existing control hardware and calibrations make it an attractive emission control package.

53577 **APTIC NO. 77986**

Environmental Protection Agency, Washington, D. C., Office of Mobile Source Air Pollution Control

EVALUATION OF THE NCAC DUAL CATALYST PINTO. *8p., May 1975.*

A prototype automobile emission control system developed by the National Clean Air Coalition was tested by the Environmental Protection Agency. The vehicle tested had a four cylinder engine and four speed manual transmission. Exhaust emissions were controlled by a dual catalyst system in which a nitrogen oxides reduction catalyst is followed by an oxidation catalyst. Exhaust emissions tests were conducted according to the 1975 Federal Test Procedure. The fuel used during the test program was a high octane lead-free gasoline. The vehicle met the 1978 Federal emission standards with a 15% decrease in fuel economy compared to a standard car with the same engine and transmission.

53578 ***APTIC NO. 78287***

Osaka Gas Co., Ltd., Osaka (Japan)

DEVELOPMENT OF LOW NOX BURNER FOR CITY GAS USE. *(Toshi gasu yo tei NOx bana no kaihatsu). Text in Japanese. Nippon Gasu Kyokai shi (J. Japan Gas Assoc.), 28(6):30-36, June 1975.*

Four types of low nitrogen oxides burners for city gas use are described. Two types (A, B) are for boiler use; two types (C, D) are for use in heating furnaces. Basically, these burners utilize the principles of exhaust gas recirculation, concentrated and diluted combustion, and two-stage combustion. The exhaust gas recirculation method is very effective for low NOx burners designed for boiler use. By combining low oxygen combustion with exhaust gas recirculation methods and two-stage combustion methods, further NOx reduction occurs. The type A burner (fuel gas pressure, above 1000 mm H2O; combustion use air pressure, 100 mm H2O; capacity, 160-2400 times 10,000 kcal/hr) utilizes the eruptive energy of city gas to circulate exhaust gas. Under operating conditions, NOx emissions of 25-35 ppm (5% conversion of oxygen concentration) were obtained for a 5-ton gas-burning boiler. The type B burner (fuel gas pressure, 100 mm H2O; combustion use air pressure, 100 mm H2O; capacity, 10-240 times 10,000 kcal/h) utilizes two-stage combustion and exhaust gas recirculation by means of eruptive energy of second- stage air. For a 0.5-ton gas-burning boiler, under operating conditions, NOx emissions of 10-20 ppm (5% conversion of O2 concentration) were obtained. By insertion of an oil gun in the center, conversion to a two-fuel burner is possible. The type C burner (fuel gas pressure, 200 mm H2O; combustion use air pressure, 450 mm H2O; capacity 20-50 times 10,000 kcal/hr) utilizes a burner which is a combination of two burner tops, one with excess air, one with excess fuel. By equalization of pressure and low-oxygen combustion, low NOx emissions (40-45 ppm; 11% conversion of O2 concentration) were obtained at a temperature of 1300 C, when the burner was attached to a forge (maximum input, 900,000 kcal/hr). The type D burner (fuel gas pressure, 50 mm H2O; combustion use air pressure, 400 mm H2O; capacity, 20-50 times 10,000 kcal/h) divides the air for combustion use into two stages before mixing with fuel gas to provide a uniform distribution of flame temperature. By decreasing the number of airholes in the second stage, and delaying the mixing of air and fuel gas in the first stage combustion region, NOx reduction was further enhanced. In an experimental furnace at 1300 C, NOx emission was 25-35 ppm (11% conversion of O2 concentration).

1974

53579 **APTIC NO. 78260**

Araki, Kunio and Shigeji Honda

ON THE CATALYTIC OXIDATION DECOMPOSITION OF ODORS BY A ZEOLITE CATALYST. *(Zeoraito shokubai ni yoru akushu seibun no sesshoku sanka bunkai). Text in Japanese. Hokkaidoritsu Kogyo Shikenjo Hokoku (Rep. Hokkaido Prefect. Ind. Exp. Stn.), no. 230:9-14, 1974. 7 refs.*

For the development of the deodorization method for exhaust gas from the drying process in a fish-meal plant, basic experiments on catalytic oxidation of odors were conducted in the temperature range of 250-500 C using natural zeolite as a catalyst. In the case of a prepared sample gas (moisture content 10%, odor concentration 50-200 microgram/l) decomposition rates of mercaptan, hydrogen sulfide and organic acids (acetic acid, propionic acid, butyric acid) were nearly 100% at 350 C in the presence of zeolite. The decomposition rate was nearly zero at 350 C when no catalyst was used. However, ammonia was not decomposed, and trimethylamine was converted to NH3 (63% at 350 C). Therefore, in the application of this method, NH3 and (CH3)N should be removed in the pretreatment process. The decomposition rate is deteriorated by high moisture content.

53580 **APTIC NO. 77974**

Barnes, Gerald J. and Richard L. Klimisch

INITIAL PERFORMANCE OF SUPPORTED NOX REDUCTION CATALYSTS IN A DUAL-CATALYST SYSTEM. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1974. 8 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974.)*

An experimental dual catalyst system was used to evaluate several aspects of the initial performance characteristics of alumina- supported platinum-group metal nitrogen oxides catalysts. The catalysts included ruthenium, Ru-platinum, Ru-palladium, mechanical mixtures of Ru and Pt, Pt-nickel, Pt, and Pd. The NOx reducing effectiveness of these catalysts was evaluated over the 1975 Federal Test Procedure (FTP). Ruthenium combinations were more effective than Pt-Ni, which was more effective than Pt and Pd. Modulated air injection was used, enabling the NOx converters to be used as oxidizing converters during vehicle start-up. A 90 sec oxidation mode provided 60% hydrocarbon and 75% carbon monoxide reductions, with increased NOx emissions of 0 to 50%, in comparison to zero oxidation mode duration. The NOx penalty was heavily dependent on the type of NOx catalyst used. The addition of a small amount of oxygen, as air, to the exhaust gases in the NOx converters enhanced NOx control. All catalysts tested gave minimum 1975 FTP NOx emissions for bleed rates in the range of 3% to 4% of total engine airflow. The air bleed effect was due to decreased ammonia formation over Ru, and to increased NOx activity due to higher catalyst temperatures over Pt. (Author abstract modified)

53581 **APTIC NO. 77979**

Cassidy, John F., Jr.

ELECTRONIC CLOSED LOOP CONTROLS FOR THE AUTOMOBILE. *Preprint, Society of Automotive Engineers, New York, 48p., 1974. 7 refs. (Presented at the International Society of Automotive Engineers Automobile Conference, Detroit, Mich., Feb. 25, 1974.)*

The application of control system technology to the problem of stoichiometric control of automobile engine air-fuel ratio is discussed. First, mathematical models of this air-fuel ratio control scheme which are necessary to apply the tools of control system analysis and computer simulation are developed. Then various control algorithms are defined and their properties are discussed and compared. Next the process of translating the mathematical description of this control system into electronic circuitry is shown. Finally, an implementation of the control strategy in electronic hardware using operational amplifiers is described. (Author abstract modified)

53582 **APTIC NO. 78247**

Dudzik, Zdzislaw and Maria Bilska

THE USE OF ZEOLITES FOR THE REMOVAL OF VOLATILE SULFUR COMPOUNDS FROM INDUSTRIAL WASTE GASES AND FROM NATURAL GASES. *(Zastosowanie zeolitow do usuwania lotnych zwiazkow siarki z przemyslowych gazow odlotowych i z gazow ziemnych). Text in Polish. Przemysl Chem., 53(12):727-730, Dec. 1974. 27 refs.*

The use of zeolites for the removal of sulfur dioxide from industrial waste gases and for the removal of hydrogen sulfide and volatile mercaptans from the natural gas or synthetic gas manufactured from coal is discussed. The effectiveness and cost of zeolite methods are superior to that of other methods. The best sorption properties with respect to sulfur dioxide are observed in faujasites and erionites. The molecular sieve 13X (a sodium form of low-silicon faujasite) is the most effective sorbent of hydrogen sulfide, produced commercially on a large scale. This zeolite is also a very effective catalyst for simultaneous oxygenation of hydrogen sulfide. The reaction with oxygen can begin at temperatures as low as -80 C. The effectiveness of zeolite reactors is enhanced by the presence of oxygen in the gas being purified, and is hindered by the presence of water or water vapor. The extraordinary catalytic activity of sodium faujasites is due to free donors, and sulfur and oxygen ion donors at their surface. A zeolite reactor is also economical.

53583 **APTIC NO. 77859**

Ehrlich, Shelton and Wayne A. McCurdy

DEVELOPING A FLUIDIZED-BED BOILER. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1974. 11 refs. (Presented at the Intersociety Energy Conversion Engineering Conference, 9th, San Francisco, Calif., Aug. 26-30, 1974, Paper 749133.)*

Pilot tests on a 10 ton/day coal-fired fluidized-bed boiler are reported, with particular emphasis on the boiler emission characteristics. Coal containing sulfur is burned over a fluidized bed of limestone particles to reduce sulfur dioxide emissions in the stack gas. Only about 35% of the sulfur was retained in initial experiments, though that figure was subsequently increased to 90%. The Environmental Protection Agency limits for new coal fired boilers, 1.2 lb SO2/million Btu input, is readily met for any coal tested. Nitrogen oxide levels in the stack gas range from 200-400 ppm in concentration. Most of the NOx arises from the oxidation of fuel-bound nitrogen. Particulate emissions from the fluidized bed are controlled by a combination of mechanical and electrostatic precipitators. Currently, a 300,000 lb (steam)/hr fluidized-bed boiler is being fabricated as part of an Office of Coal Research test program.

53584 **APTIC NO. 78745**

Glowiak, Bohdan and Adam Gostonczyk

INDUSTRIAL GAS CLEANING BY ION EXCHANGERS. *(Oczyszczanie gazow przemyslowych metoda jonitowa). Text in Polish. Ochrona Pracy (Prague), (11):17-18, Nov. 1974. 5 refs.*

Results of an investigation on the applicability of ion exchangers to remove acidic impurities from industrial gases are described. The device operates on the principle of sorption of acidic gases by ionic substances with simultaneous and continuous regeneration. The concentration of gases can be arbitrary. The temperature of the gases being cleaned should not be higher than 333 K and a preliminary removal of dust particles is required. The process can use practically all industrial anions capable of absorbing HSO3 and SO3 anions from aqueous solutions. The diameter of the anionic particles must be greater than 0.004. The process can have an effectiveness of 99% when it is used for removal of such acidic impurities as sulfur dioxide, nitrogen oxides and hydrogen fluorides. The process can therefore be used to clean industrial gases from sulfuric acid plants, emissions from phosphate fertilizer plants from glass- works, from aluminum smelting plants.

53585 **APTIC NO. 77978**

Hals, F. A., R. E. Gannon, D. B. Stickler, B. Kivel, F. E. Becker, and H. F. Steinle

PROGRESS IN DEVELOPMENT OF AUXILIARY MHD POWER PLANT COMPONENTS AT AVCO EVERETT RESEARCH LABORATORY, INC. *Preprint, The American Society of Mechanical Engineers, New York, Energetics Div., 24p., 1974. 20 refs. (Presented at the American Society of Mechanical Engineers Winter Annual Meeting, New York, Nov. 17-22, 1974.)*

Progress in the development of high temperature air preheaters, methods for coal combustion, and techniques for emission control of nitrogen oxides in the effluent gas from a magnetohydrodynamic (MHD) power plant is reviewed. The cooling rate of the generator exhaust gas is an important design criterion in the application of two-stage combustion for emission control of nitrogen oxides. Detailed radiative transport analyses with division into a transparent and diffusion radiative component and including effects from axial radiation and fluid dynamic effects have been conducted for establishing the exact cooling rate of the exhaust gas in a radiant furnace. Design calculations for such a radiant furnace with kinetic calculations of the gas chemistry have shown that it is practical and economically feasible with available technology to reduce the emission of nitrogen oxides to a small fraction of Environmental Protection Agency emission standards. Experimental investigations of further reduction of nitrogen oxides by refractory materials revealed that the level of nitrogen oxides in the gas from a high temperature alumina refractory type air heater could be reduced to 50 ppm or less. (Author abstract modified)

53586 **APTIC NO. 78021**

Ishiguro, Tatsukichi

ODOR CONTROL AT INCINERATION FACILITIES. *(Nensho setsubi ni okeru akushu kogai to sono taisaku). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(6):102-106, June 1974.*

A quantitative study of odor from factories has just been started, although chemical analysis and instrumental analysis are both mentioned in the Odor Prevention Law. Countermeasures include: reducing the odor below threshold, altering the odor to a less objectionable one, eliminating it completely, and neutralizing or masking with other odors. Combustion, adhesion, contact oxidation, oxidation, absorption, reaction, and condensation can be used to carry out these measures. However, before these measures can be applied, the source of odor must be reduced as much as possible. The source must be tightly closed (or odor must be brought to the processing facilities), the process of odor elimination must be improved. Also, raw materials and processing methods must be controlled strictly and reviewed often.

53587 **APTIC NO. 78343**

Kolenec, Jaroslav

A FIRON FILTER MAT FOR AIR CLEANING. *(Filtracni rohoze firon pro cisteni vzduchu). Text in Czech. Pracovni Lekar (Prague), 25(5):184-186, May 1974.*

The firon air filter material, manufactured by the Mitop State Enterprises in Minon, CSSR, is described. The material design is based on electron microscope observations of the kinetics of the filtering of solid particles which accumulate on the filter in the form of tree-like clusters whose rate of growth and ultimate height are inversely proportional to the fiber diameter. The filter consists of many alternating thin layers of fine-fiber material superimposed on layers of thick-fiber material. The most recent material is firon B-400. Its surface weight is 400 g/sq m and its thickness can be varied between 10 and 25 mm by compression. The recommended rate of flow is 4680-5400 cu m/hr-sq m which corresponds to input air velocities of 1.3-1.5 m/sec. The mats can be used up to a maximum pressure loss of 20 kp/sq m. The temperature range is 50-100 C, but an occasional exposure to 150 C will have no adverse effect on filter parameters. Filters may be easily recharged by cleaning. Standard dimensions are rolls of 18 by 1.8 m or pieces of 495 by 495 mm.

53588 **APTIC NO. 78344**

Lupa, Zygfryd and Janusz Laskowski

DESULPHURIZATION OF COAL IN A FLUIDIZING SEPARATOR. *(Odsiarczanie wegli energetycznych w separatorze fluidyzacyjnym). Text in Polish. Zesz. Nauk. Politech. Slaskiej Ser., Gornictwo, (60):27-43, 1974. 16 refs.*

Laboratory and pilot plant tests are described which were conducted in order to ascertain the applicability of compressed air, dry fluidizing process to desulfurization of coal from the Jaworznicki-Mikolowski region of Upper Silesia. This coal has a low heat value and is almost exclusively used by electric power plants. Its sulfur content is over 3.5%, of which 60% is in the form of pyrite, whose specific gravity is considerably different from that of coal. The separator design was based on Polish patent No. P146714, with a higher capacity model being used for pilot plant tests. Samples from four coal mines were crushed pneumatically to grain sizes ranging from 0.06 to 6.0 mm in diameter and used in the tests. In most cases more than 50% of the original sulfur content of the coal has been concentrated in about 15% of the waste material. The process is most effective for grain sizes ranging from 0.25 to 2.0 mm in diameter. Processing of smaller particles can be made effective only with considerable mechanical modifications of the existing separator design.

53589 **APTIC NO. 78346**

Markvart, Miroslav and Vladimir Pour

SELECTIVE REDUCTION OF NITRIC OXIDE WITH AMMONIA AND NON-PLATINUM CATALYSTS. *(Selektivni redukce kyslicniku dusiku amoniakem na neplatinovych katalyzatorech). Text in Czech. Chem. Prumysl (Prague),24(11):545-547, Nov. 1974. 21 refs.*

Because of their high cost and a high vulnerability to sulfur compounds it is desirable that platinum catalysts used in reduction of nitric acid by ammonia be replaced by non-platinum catalysts. A group of 11 metal oxides, or their combinations, was tested for their effectiveness as catalysts of this reaction. The selection was based on the available literature and each catalyst was prepared in the form of a deposit on aluminum carrier grains, measuring 0.5-1.0 mm in diameter. In the absence of oxygen, the platinum catalysts resulted in an almost total conversion of NO at a temperature of 300 C and the only other catalyst that exhibited a comparable activity was a mixture of cupric oxide and chromic oxide at the temperature of 323 C. In the presence of oxygen, normally used in this reaction to reduce excess ammonia, the catalysts whose performance was comparable to that of platinum were manganese dioxide combinations of manganous oxide and Cr2O3, CuO and combinations of CuO and Cr2O3. The optimum reaction temperatures for these catalysts were all higher than the optimum temperature for platinum (200 C).

53590 **APTIC NO. 78084**

McNall, Preston E., Jr.

REDUCTION OF TOBACCO SMOKE CONTAMINANTS IN INTERIOR SPACES BY MEANS OF FILTRATION. *Scand. J. Resp. Dis. (Copenhagen), (91):37-43, 1974. 9 refs.*

Procedures for determining the efficiency of filtration methods for the reduction of tobacco smoke contaminants in interior spaces are reviewed. In the weight method procedure, an artificial dust is fed into the sample filter. The portion which passes through the filter is collected and measured. The efficiency is expressed by calculating the weight of dust held by the filter, divided by that fed to the filter. In the atmospheric dust spot efficiency method, a sample of air is drawn through a dense glass fiber filter paper. Contamination collects on the surface of the filter paper, causing a stain. This stain is measured by a photometer, which reads opacity, defined as the percent reduction in light passing through the paper after staining. This method heavily favors particles in the size range of 0.1-3 micron and is almost insensitive to larger particles. Tobacco smoke is within that size range and dust spot readings estimate filter performance for tobacco smoke with practical accuracy.

53591 **APTIC NO. 78286**

Minamidani, Hiroshi, Ryo Ikuyama, Chutaro Machida, Koji Kawashima, Yoshihiro Matsudaira, and William R. Mallet

THE EFFECTS OF METALS CONTAINED IN ENGINE OILS ON THE ACTIVITY DETERIORATION OF AUTOMOBILE CATALYTIC CONVERTERS. *(Enjinyuchu no kinzoku ga jidoshayo shokubai konbata no kassei teika ni oyobosu eikyo ni tsuite). Preprint, Japan Society of Automotive Engineers, p 303-313, 1974. (Presented at the Japan Society of Automotive Engineers Lecture Meeting, Tokyo, Japan, Oct. 15-17, 1974, Paper 42.)*

An experiment was carried out to study the poisoning effects of lead and phosphorus on an exhaust gas oxidation catalyst. The engine used for the study was 1770 cc, four-cylinder water-cooled type with a horsepower of 105. The catalyst was an Engehalt PTX-4S platinum system. Gasoline containing less than 0.001 g/l of Pb was consumed at a rate of 1 l/1000 km. The poisoning effects were determined by measuring the carbon monoxide and total hydrocarbon concentrations. Carbon monoxide and carbon dioxide were analyzed by a nondispersive infrared method and total hydrocarbons by a flame ionization detector. Zinc and P in gasoline were in the form of Zn dialkyl dithiophosphate (ZDDP). The effects of metal sulfonates on catalysts with a high platinum content were almost negligible; they became significant, however, with decreasing Pt content. Phosphorus in ZDDP had the greatest effect on catalyst poisoning. The effect was eased due to the co-existence of calcium, barium, and magnesium sulfonates. Phosphorus in engine oil had a greater poisoning effect on the catalyst than did lead in gasoline.

53592 **APTIC NO. 77987**

Plaks, N.

THE EPA PROGRAM OF R AND D FOR THE CONTROL OF COKEMAKING EMISSIONS. *Preprint, American Inst. of Mechanical Engineers, 12p., 1974. 3 refs. (Presented at the Ironmaking Proceedings, Metallurgical Society Meeting, Atlantic City, N. J., 1974.)*

Projects were carried out to reduce air pollution in connection with charging and pushing in coke manufacture. A charging system for coke ovens was developed based on the concept that coal is fed into an oven from a hopper that always has a surplus of coal in it to provide a positive seal and to prevent emissions from entering the atmosphere at that point. The charging chute simultaneously is mechanically sealed to the ring at the charging port. A sufficiently large steam ejector is placed in the standpipe to maintain a negative pressure within the oven with any one charging port or the chuck door open. Two separate projects were undertaken for pushing of coke ovens, with different approaches for new and existing coke batteries. The enclosed pushing and quenching system for new batteries includes a hood over the coke guide, an enclosed hot coke transfer car, and an enclosed control rate underground station. The principal features of the smokeless coke pushing system for existing batteries are a fume collecting hood enclosing the coke guide and covering the quench car, a fume main and gas cleaning unit, and a modified standard quench car. The fume collecting hood will enclose the hot coke as it emerges from the oven and falls into the quench car. Since pushing operations take place at each oven, the hood is designed to travel on the existing coke guide machine from oven to oven, connecting into the fume main at each point.

53593 **APTIC NO. 78263**

Saito, M.

KNORCA DENITRIFICATION PROCESS. *(KNORCA-ho datsusho purosesu ni tsuite). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Assoc. Japan), p. 184-194, Oct. 1974. 1 ref.*

The emission sources of nitrogen oxides, control methods for NOx formation (modification of combustion conditions, modification of combustion methods, fuel conversion) and denitrification processes and reaction mechanisms (catalytic reduction, catalytic decomposition, adsorption, absorption, electron ray irradiation) are reviewed. The KNORCA method, developed by Kurashiki Boseki Co. for the denitrification of flue gas, employs the catalytic reduction method using ammonia. The characteristic of this method is the use of inexpensive catalysts rather than the precious metal catalysts commonly used for catalytic reduction. Metal oxides (cupric oxide, ferric oxide, nickel oxide, cobalto- cobaltous oxide, manganese oxide) treated with sulfates and carried on alumina were used as catalysts. The catalytic activity and life, the effects of reaction conditions (NOx concentration, reaction temperature, space velocity) and side reactions were investigated. A denitrification rate of above 90% was achieved in the temperature range of 350-450 C using 1.2-1.5 times the theoretical amount of NH3 with regard to the inlet concentration of NOx.

53594 **APTIC NO. 78375**

Tomoto, Hiroshi

AIR POLLUTION AND ODOR PREVENTION TECHNIQUES. *(Taiki osen to akushu boshi gijutsu). Text in Japanese. Kako Gijutsu (Process. Tech.), 9(6):5-11, 1974.*

Pollution control measures must meet not only the present control standards, but should also be in agreement with the more stringent control standards expected to be enforced in the future. However, such planning is not always economically feasible. For sulfur oxides, the environmental standard was revised to 0.04 ppm in 1973. The so-called K value control method is practiced. The SOx control measures, through the use of fuels with lower sulfur content and the desulfurization process, are outlined. As for smoke, the emission standard is in the range of 0.05-0.8 gr/N cu m depending on the type and size of combustor. Control measures involving modification of the combustion method focus on the selection of fuel, the temperature in the combustion chamber, and the air-fuel ratio. The dust-removal method by dust collectors, such as the cyclone dust collector and electrostatic precipitator are also discussed. As for nitrogen oxides, the environmental standard is 0.02 ppm, while the emission standard varies depending on the emission source. The NOx control measures by various modifications in the combustion system are described. The NOx control by means of the denitrification process is still in the stage of pilot plant testing. The odors specified by the law are ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide and trimethylamine. Control measures by means of atmospheric dilution, adsorption of odors, absorption and washing process, direct combustion and catalytic oxidation are discussed.

53595 **APTIC NO. 78139**

Tsukamoto, Yasuhiro

QUANTITY OF HYDROGEN SULFIDE IN THE TAGONOURA SEDIMENT AND PREVENTIVE EFFECT OF THE SLAKED LIME WASTE (II). *(Tagonoura-ko chinden odei no ryuka suisoryo to shosekkai no ryukasuiso boshi koka ni tsuite (II)). Text in Japanese. In: Rept. of Shizuoka Prefect. Ind. Exp. Sta., no. 18:81-90, Feb. 1974.*

Sludge was sampled from Togonoura sediment and steam distillation was carried out using 1-2 g of the sample. The distillate was treated with zinc sulfate solution and with excess iodine solution. After being acidified with hydrochloric acid, it was titrated with sodium thiosulate to determine the reacted I2, from which hydrogen sulfide was determined. Sulfide in the residue of the steam distillation was determined in the same way following acidification and steam distillation. The upper layer of the sedimented sludge contained on the average 3.00 kg sulfur/ton whereas the lower layer contained on the average 1.41 kg S/ton; the average S content of the sludge was 2.31 kg S/ton; the average moisture content was 82.5%; the S content of the sludge increased 67% compared to the previous year; treatment of the sludge with slaked lime suppressed the increase of S content.

53596 **APTIC NO. 77998**

Vlasenko, V. M. and V. Y. Vol fson

FINE CATALYTIC CLEANING OF GASES. *(Osnovni zakonomirnosti protsesiv tonkogo katalitichnogo ochishcheniya gaziv). Text in Ukrainian. Visnik Akad. Nauk Ukr. RSR, no. 3:53-60, 1974. 47 refs.*

The literature of air pollution abatement and control in the USSR is reviewed. Both physical and chemical means are available to purify exhausts and emissions produced by industry and automotive transport. Emission gas recycling has the added benefit of making additional materials available to industry at a saving. Chemical techniques are based on the catalytic conversion of gaseous pollutants and industrial exhaust admixtures. Catalysts may be constructed of either homogeneous or heterogeneous materials. Hydrogen and other valuable gases may be retrieved, and carbon monoxide removed, from gaseous emissions and pollutants through various chemical techniques. The direct detoxification of pollutants is often not feasible, and complex techniques are required. Suitable methods are available for processing sulfur compounds, as well as for methane and propylene gases. The external diffusion method, although not widely used, seems most promising for general catalytic converter use. The physical and chemical properties of the catalytic media, and of the end products, must be considered in order to optimize the cleansing effect, and to avoid catalyst blockage or failure. Reactions between the agents recovered and the catalysts are to be avoided.

53597 **APTIC NO. 77710**

Williams, R. J., R. G. Draper, and B. I. Parsons

CATALYSTS FOR HYDROCRACKING AND REFINING HEAVY OILS AND TARS. PART 1: THE EFFECT OF COBALT TO MOLYBDENUM RATIO ON DESULPHURIZATION AND DENITROGENATION. *Dept. of Energy, Mines, and Resources, Ottawa (Ontario), Mines Branch, Div. Rept. FRC 74/24-CAT, Tech. Bull. TB 187, 26p., Feb. 1974. 16 refs.*

The effect of the cobalt to molybdenum ratio of a hydrocracking catalyst on the desulfurization and denitrogenation of high- boiling gas-oils and bitumens was investigated. Active catalysts of the cobalt molybdate on alumina type, containing 3% and 13% combined metal oxides were prepared by a surface layering technique using a mix-muller. A gradual leveling out, or plateau, of activity for both sulfur and nitrogen removal was observed near a cobalt to molybdenum atomic ratio of 0.6. The denitrogenation activity of the cobalt molybdate catalysts increased more slowly with the overall concentration of metals than did the desulfurization activity. The overall sulfur removal at 400 C was 87%, while that for nitrogen was 50%. When the extent of desulfurization and denitrogenation was high, there was a considerable lowering of the specific gravity with the result that the volume yield of oil product always exceeded 100%. At the 80 and 90% desulfurization levels the volume yield was generally in the region of 103-104%. No measurable catalyst deactivation occurred in the experiments, and no deposits, tar, or coke were detected on any of the catalysts tested. (Author abstract modified)

53598 **APTIC NO. 77854**

Young, Larry C. and Bruce A. Finlayson

MATHEMATICAL MODELING OF THE MONOLITH CONVERTER. *In: Advances in Chemistry Series. American Chemical Society, No. 133, Chemical Reaction Engineering--II, Washington, D. C., 1974, p. 629-643. 21 refs.*

Mathematical models for the monolith converter are developed and applied to the oxidation of carbon monoxide in automobile exhausts. The converter consists of an array of ducts with catalyst coating the walls. The exhaust gas flows axially through the ducts in laminar flow. Two models for this type of converter are proposed and solved numerically. The simpler model uses heat and mass transfer coefficients for fully developed flow in ducts to account for the resistance to transfer between the fluid and the catalytic wall. The more complicated model accounts for the distribution of mass and energy in the duct cross section, which is assumed to be circular. Both transient and steady state calculations are performed for conditions which would be expected during vehicle operation. Mass and energy distribution in the duct cross section is important. Transient calculations predict that the wall temperature can overshoot the steady state adiabatic temperature and thus contribute to converter failure. (Author abstract)

53599 **APTIC NO. 78145**

Sadaki Agricultural Machinery Co., Ltd. (Japan.)

A RECYCLING SYSTEM FOR OGRANIC SOLID WASTE INTO FERTILIZER AND FEED: SASAKI-ATLAS DRYER PLANT. *(Yukishitsu haikibutsu, hi, shiryo kangen sochi, Sasaki, Atlas kanso shori puranto). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 4(6):43-46, Aug. 1974.*

Based on the pollutionless organic matter conversion treatment plant developed by the Atlas Co. of Denmark, Sasaki Agricultural Machinery Co. developed a completely enclosed odorless dryer plant for excretion and various sludges to be used as feed or fertilizers. Chicken excretion, various activated sludge such as beer brewery sludge, food processing sludge, marine product processing sludge, pulp mill sludge, organic sludge such as stockyard sludge, protein sludge, and fruit juice residues are stored first in the storage silo. A closed conveyor that can be operated continuously or intermittently transports the material to the mixer; after mixing and crushing, a desired amount is sent to the feeder. Hot air containing a large amount of water is sent in at a high speed for drying. The dried product is sent to the cyclone where the product and odorous gas are separated. Part of the product is fed back and mixed with untreated material and crushed. The dried material is disinfected with heat and sent to the cooler. The finished product is sent to the storage silo by a conveyor and put into cold storage; it is then packed and shipped. The air is supplied from only one duct and hydrogen sulfide, ammonia and other odors are all completely eliminated by the deodorization incinerator. From the beginning to end, the material is treated in an airtight closed system.

1973

53600 **APTIC NO. 77629**

Andon ev, S. M., V. S. Gur ev, and M. L. Kutsyshin

PROSPECTS FOR PROTECTING THE ENVIRONMENT FROM POLLUTION CAUSED BY FERROUS-METALLURGY PLANTS. *(Perspektivy zashchity okruzhayushchey sredy ot zagryazneniy vybrosami predpriyatiy chernoy metallurgii). Text in Russian. Perspekt. Preobrazov. Okruzhayushchey Cheloveka Gor. Sredy, 1973, p. 297-309.*

The tasks and possibilities in air and water pollution control in ferrous metallurgy industries are reviewed. The emission of pollutants, such as carbon monoxide, sulfur oxides, nitrogen oxides, and mineral dusts in metallurgical plants can be controlled by technological improvements, or by the introduction of new technologies, such as electrical smelting and the converter process. The sulfur dioxide and nitrogen oxides emissions can be controlled by the removal of sulfur and nitrogen compounds from masout and coke. The overall waste gas emission can be controlled by the replacement of air by oxygen in combustion and melting processes, and by flue gas recirculation. Dry mechanical dust separators are used primarily for coarse dust at high dust concentration, and venturis with a droplet separator are the most commonly used wet type mechanical separators. Scrubbers without filling have limited use in ferrous metallurgy. Tissue filters and ceramic or granular filter layers are promising, while electrostatic precipitators are most economical and are used most commonly. Wet type electrostatic precipitators are used primarily for explosive flue gases. Carbon dioxide emissions are controlled by full or partial incineration within the furnace, or in high torches. Scrubbers with limestone or slaked lime suspension have efficiencies of up to 90-95% in terms of SO2 removal. The investments for air pollution control measures in ferrous metallurgy are expected to decline after 2000.

53601 **APTIC NO. 77973**

Barnes, Gerald J. and Richard L. Klimisch

INITIAL OXIDATION ACTIVITY OF NOBLE METAL AUTOMOTIVE EXHAUST CATALYSTS. *Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1973. 11 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973.)*

The use of relatively small catalytic converters containing alumina-supported platinum and palladium catalysts to control exhaust emissions of hydrocarbons (HC) and carbon monoxide was investigated in full-scale vehicle tests. Catalytic converters containing 70 to 80 cu in. of fresh catalyst were installed at two converter locations on the vehicle. Carburetion was richer than stoichiometric, with air-fuel ratios comparable to those proposed for dual catalyst systems containing a nitrogen oxides reduction catalyst. The vehicle was equipped with exhaust manifold air injection. Homogeneous thermal reaction in the exhaust manifolds reduced HC and CO emissions by 70% and 55%, respectively. Four Pt catalysts, three Pd catalysts, and one Pt-Pd catalyst were prepared and evaluated. Total metal loadings were varied between 0.01 and 0.07 troy oz. Hydrocarbon conversion efficiencies varied between 62% and 82%, measured over the 1975 cold-hot start weighted Federal Test Procedure. Corresponding CO conversions ranged from 89% to 97%. The single most important factor affecting vehicle emissions was the location of the catalytic converter. Catalysts installed in the front converter location performed better, primarily because catalyst temperatures were about 250 F. higher. The converter location effect was most noticeable during warmup operation. There were no larger differences in the emission control capabilities of Pt versus Pd catalysts. These metals had equal initial oxidation activity. Sufficient initial oxidation activity was given by 0.04 troy oz of either Pt or Pd to reduce HC and CO emissions to the desired 1975 and 1976 federal emission limits. (Author abstract modified)

53602 **APTIC NO. 77858**

Cagliostro, D. E. and E. L. Winkler

METHANATOR FUELED ENGINES FOR POLLUTION CONTROL. *National Aeronautics and Space Administration, Moffett Field, Calif., NASA Ames Research Center, Unit 501-21-22-02-00-21, Rept. NASA TM-X-62,263, Rept. Performing Organization A-5833, 49p., March 1973. 52 refs.*

NTIS: N75-15051

Comparison of a methanator fueled Otto-cycle engine is made with other methods proposed to control pollution due to automobile exhaust emissions. The comparison is made with respect to state of development, emission factors, capital cost, operational and maintenance costs, performance, operational limitations, and impact on the automotive industries. The methanator fueled Otto-cycle engine is projected to meet 1975 emission standards, to operate at a lower relative total cost compared to the catalytic muffler system, and to have low impact. Additional study is needed for system development. (Author abstract)

53603 **APTIC NO. 77861**

Dunthorn, D. I. and M. J. Stephenson

SOLVENT PURIFICATION SYSTEM FOR THE FLUOROCARBON ABSORPTION SYSTEM. *Union Carbide Corp., Oak Ridge, Tenn., Gaseous Diffusion Development Div., Atomic Energy Commission Contract W-7405-eng 26, Rept. K-L-6325, 17p., July 16, 1973.*

NTIS: K-L-6325

The distillation removal of nitrogen dioxide from the recirculating solvent in a reactor reduces NO2 concentration in off-gas from the absorber column. The fluorocarbon absorption system has an often high tolerance for process impurities, such as iodine and NO2, which collect in the recirculating solvent. With the addition of a solvent purification step, the process can become a recovery system for these impurities. The selective absorption process for krypton-xenon removal can be applied to off-gas decontamination in a liquid metal fast breeder reactor fuels reprocessing system. The solvent purification system can consist of a distillation column with reboiler and condenser auxiliaries. Experiments show that recycling of a solvent stream with subpercentage levels of NO2 results in a very low loss to the purified air vent stream, and thus the column can be top fed with reflux under conditions that allow the removal of 90% of the NO2 from the recirculating solvent stream. (Author conclusions modified)

53604 **APTIC NO. 77638**

Itkina, D. Y., V. A. Klevke, and T. I. Nazarova

REMOVAL OF AEROSOLS FROM WASTE GASES IN THE PRODUCTION OF AMMONIUM NITRITE. *(Ochistka otkhodyashchikh nitroznykh gazov proizvodstva nitrita ammoniya ot aerozoley). Text in Russian. Tr. Gos. Nauch.-Issled. Proektn. Inst. Azotn. Promsti. Prod. Org. Sint., no 19:86-94, 1973. 4 refs.*

Experiments with the condensation-diffusion method for the removal of ammonium nitrite and ammonium nitrate from nitrous gases generated in ammonium nitrite production are described. The condensation-diffusion method consists of the saturation of aerosol-containing gases with water vapor to which 3% nitric acid solution has been added, and of the subsequent condensation of the vapor together with the aerosol on cold surfaces due to diffusion forces generated by the temperature and pressure difference between the vapor and the cold surface. The efficiency was found to be higher for ammonium nitrite than for ammonium nitrate. The highest separation rate for ammonium nitrite and nitrate at 98% can be achieved at a vapor:gas ratio of 3:1 for ammonium nitrate aerosol, and a vapor:gas ratio of 2:1 for ammonium nitrite. Ammonium nitrite can be removed at 97% efficiency at a vapor:gas ratio of 1:1.

53605 **APTIC NO. 77853**

Jagusiewicz, A.

EVALUATION OF THE OPERATING EFFICIENCY OF ELECTROFILTERS INSTALLED IN POLAND IN 1966-1970. *(Ocena efektywnosci pracy elektrofiltrow zainstalowanych w Polsce w latach). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(5):1-13, 1973.*

NTIS: TT 73-54096/5

The operating efficiency of 54 electrofilters installed in Poland in 1966-1970 was evaluated. The average efficiency of the electrofilters under analysis was below 90% and is the result of design constructional errors, defective manufacture and assembly, and careless exploitation of the pollution unit and the electrofilter. Recommendations for improving the efficiency of the electrofilters in each of the problem areas are made. The recommendations include a more precise determination of physico-chemical parameters of the dust gas medium, with special emphasis on intensity of combustion gas flow, temperature and humidity of combustion gases, concentration of dustiness, fractional composition of dust, and electrical parameters of dust.

53606 **APTIC NO. 77630**

Malov, R. V., V. S. Nos, E. I. Bozhenok, Y. Y. Vlasov, and E. A. Ermolov

REDUCTION OF NITROGEN OXIDES AND SOOT IN DIESEL EXHAUST. *(Snizhenie vybrosa dizelyami okislov azota i sazhi). Text in Russian. Dvigateli Vnutrennego Sgoraniya (Kharkov), no. 18:166-174, 1973. 8 refs.*

The effect of reducing the lead angle of fuel injection in the high-speed diesel engine 6Ch 12/14 on oxides of nitrogen and soot emissions was studied. At an idle speed of 1500 rpm, a reduction of the lead angle by one third from the economic optimum reduced the nitrogen oxides emission fourfold, and increased the soot emission by 2.5 times, while lowering the engine capacity by only 5%. This adjustment is recommended for high-speed diesels used in mines, tunnels, and other limited and closed spaces. The carbon monoxide, aldehyde, and hydrocarbon emissions can be reduced by means of catalytic converters using a ShPK-2 aluminum-platinum catalyst. The increased soot emission can be controlled by the addition of barium-base anti-smoke additives type SLD (Belgian) or IKhP-706 (domestic) to the fuel at a rate of 0.5% by volume. However, the use of such additives is limited by the high sulfur-content of the fuel.

53607 **APTIC NO. 77886**

Selecki, A. and A. G. Chmielewski

SPRAYED DUST COLLECTING COLUMN WITH A POLPAK FILLING. *Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(2):32-42, 1973. 6 refs.*

NTIS: TT 73-54096/2

Polpak filling consists of helicoidally coiled full or reticulated metal or plastic ribbons. It can be used in defogging and in wet dedusting of gases, nonmembraneous cooling of liquids and gases, humidifying gases, distillation, absorption, and extraction. The process of dust collection by means of the sprayed column with Polpak filling was investigated. The filling was sprayed with water from above. The following dusts were used: feldspar 4900, dust from the bag filters of a ceramic tile factory, and dust from the bag filters of the molding processing assembly of a steelworks. Measurements were carried out at various amounts of Polpak filling and, in the case of feldspar 4900, at various heights of the column. The tests showed this equipment to be highly effective in dedusting at relatively low flowing resistance of gas and high output. Total efficiency of dust collection by the column under discussion reached 95% to 99% for the dusts under study. (Author abstract modified)

53608 **APTIC NO. 77989**

Tieman, John W.

CONTROL OF SULFUR DIOXIDE EMISSIONS. *Wright State Univ., Dayton, Ohio, Environ. Probl. Extractive Ind. Workshop Proc., Dayton, Ohio, 1973, 15p. (June 10-13.)*

Methods for removing sulfur dioxide from flue gas are discussed. Adding dry limestone to a boiler removed a maximum of 50% of the sulfur dioxide, with 35% to 40% the norm. The basic processes of lime/limestone scrubbing systems include injection of limestone into the boiler followed by collection in a wet scrubber, scrubbing the flue gas with a slurry of limestone, and scrubbing the flue gas with lime instead of limestone. Several specific systems are described. Two sodium-base scrubbing systems are described. Sodium carbonate will be used as the scrubbing medium in a throwaway system in a dry area where soluble sulfite-sulfate salt can be discarded without causing a major water pollution problem. A product recovery system removes fly ash in a prescrubber, and an absorption column absorbs sulfur dioxide with sodium sulfite to form the bisulfite, which is sent to a crystallizer where the pyrosulfite is crystallized from the solution. The pyrosulfite is dissolved in water, and better than 90% of the sulfur dioxide is removed by steam stripping. Magnesium oxide scrubbing processes are similar to lime scrubbing processes. The principal difference is that the magnesium sulfite and sulfate reaction products can be regenerated, producing magnesium and sulfate reaction products can be regenerated, producing magnesium oxide for reuse in the scrubber loop. The basis for the catalytic oxidation process is the high temperature oxidation of sulfur dioxide to sulfur trioxide followed by the recovery of sulfuric acid. The process can remove 85% to 90% of the sulfur dioxide. Other processes currently being investigated are described.

53609 **APTIC NO. 77898**

Vaiteanu, Dan

INTERNAL COMBUSTION ENGINE ADJUSTMENT--AN IMPORTANT MEANS OF COMBATING ENVIRONMENTAL POLLUTION. *(Reglajul motorului cu benzina--mijloc important in combaterea poluarii mediului). Text in Romanian. Transporturi auto navale si aeriene, 3(20)(7):367-370, and 381, 1973. 5 refs.*

Adjustment of the internal combustion engine in order to control emissions of noxious gases is discussed. The adjustment involves control of the lambda dosage of the air-gasoline mixture and the advancement value at production of the electric spark. A decrease in fuel values in the mixture leads to a decrease in the concentrations of carbon monoxide and hydrocarbons, and an increase in the nitric oxide concentration. Reduction of acceleration leads to a decrease in hydrocarbons and nitric oxide concentrations, due to an increase in the temperature of the gas and more rapid burning in the evacuation collector. A slight modification in the position of the adjustment screw leads to a 100% increase in carbon monoxide emission at speeds up to 60 km/hr only. This acceleration tendency leads to a 100% increase of pollution, especially in cities with heavy traffic. In Bucharest, Romania, after adjustments were made to produce deceleration in 98% of the vehicles, the carbon monoxide emissions decreased by 35%.

1972

53610 **APTIC NO. 77712**

Schwehr, E. W.

REGULATIONS AND FACILITIES FOR THE PREVENTION OR REDUCTION OF ACCIDENTAL SPILLS OF TOXIC PRODUCTS. LONG-TERM AND EMERGENCY MEASURES. *(Dispositions et dispositifs pour prevenir ou reduire les deversements accidentels de produits toxiques. Mesures a long terme et mesures d urgence). Text in French. Cent. Belge Etude Doc. Eaux, 25(347):406-409, Oct. 1972.*

Sources of accidental spills of toxic products, as well as the regulations and facilities for the prevention of these are discussed. The sources of spillage include reception, storing, and manipulation; dosage of substances to be processed; various processing operations; evacuation of residual products; storage of the products; product packaging; delivery of finished products to the consumer; and utilization products by the consumer. Preventive measures include protective packaging, controlled ventilation, employment of pneumatic systems, utilization of protective equipment during handling and storage enclosures with collection by scrapers. Proper working conditions, manipulation, and dosage of the products reduce the spillage risks to a minimum. With loose liquid products, spillage occurs due to deficient pumps, pipes, sewage systems, and working systems, while with packaged liquid products, spillage occurs due to faulty packaging. Both loose and packaged liquids cause the same atmospheric pollution problems and explosion risks. Spills usually occur during transportation. Most spills occur during packaging and transportation. To decrease the danger of spills, the volume of transported and packaged materials should be limited.

MEASUREMENT METHODS

1975

53611 **APTIC NO. 78160**

Adams, F. C. and R. E. Van Grieken

ABSORPTION CORRECTION FOR X-RAY FLUORESCENCE ANALYSIS OF AEROSOL LOADED FILTERS. *Anal. Chem., 47(11):1767-1773, Sept. 1975. 37 refs.*

A method for the evaluation of fluorescence radiation absorption in the analysis of air particulate material collected on depth filters and imperfect screen filters is described. The total absorption effect is divided into two components, one due to the particulate itself, and one due to the filter material. The first effect is calculated after evaluating the mass absorption coefficient by transmission measurements. The second correction is obtained by determining experimentally a hypothetical equivalent depth defined as the one hypothetical depth from which the particulate material would give rise to the same filter absorption effect as that obtained from the actual distribution. Measurements of the ratio of the fluorescent intensities obtained from the front side of the filter and from its back side allow this hypothetical depth to be calculated. The method is applied to the determination of calcium and sulfur in air pollution dust collected on Whatman and Millipore filters. The determinations of all the factors involved are carried out, and typical values are shown. (Author abstract modified)

53612 **APTIC NO. 77643**

Altshuler, Samuel L.

DESIGN AND USE OF A VAN EQUIPPED TO MEASURE AMBIENT AIR QUALITY FOR SULFUR AND OXIDES OF NITROGEN COMPOUNDS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.4.)*

A mobile laboratory equipped to measure ambient concentrations of sulfur dioxide, hydrogen sulfide, nitric oxide, and nitrogen dioxide is described. The instrumentation includes a sulfur chromatograph, a nitrogen oxides analyzer, a calibrator equipped with NO2, H2S, and SO2 permeation tubes, strip chart recorders, and a 4-kilowatt motor generator. The instruments can be operated using generator power or external line power when available to allow for uninterrupted operation of the instrumentation. The van is being used in the vicinity of larger fossil fuel power plants to investigate effects of fuel changes on air quality and also in the vicinity of geothermal power plants to measure the distribution and fate of H2S emitted during geothermal energy utilization. (Author abstract modified)

53613 **APTIC NO. 78378**

Bailey, P. L. and M. Riley

PERFORMANCE CHARACTERISTICS OF GAS-SENSING MEMBRANE PROBES. *Analyst, 100(1188):145-156, March 1975. 15 refs.*

The construction and performance of gas sensing membrane probes are described and discussed. Experimentally, probes to measure ammonia, sulfur dioxide, and nitrogen oxide in aqueous solution are studied. In particular, the effects of temperature and osmotic pressure are examined; the response speeds of the probes are determined; and their use in continuous analysis is investigated. Selectivity is discussed. Consideration is given to the development of new methods of analysis and current applications of the probes are mentioned. (Author abstract modified)

53614 **APTIC NO. 75931**

Bartle, E. R. and E. A. Meckstroth

INFRARED SENSOR FOR THE REMOTE MONITORING OF SO2 (FINAL REPORT). *SAI, Inc., La Jolla, Calif., JRB Associates Div., Environmental Protection Agency Contract 68-02-1208, Program Element 1AA010, ROAP 26AAP, Rept. EPA-650/2-75-041, 54p., May 1975. 8 refs.*

NTIS: PB 243478/AS

A prototype passive infrared sensor the remote monitoring of sulfur dioxide emissions from stationary sources is described. The device is battery operated and portable and utilizes the principle of gas filter correlation to minimize the effects of the background atmosphere. The sensor s sensitivity is limited to about 70 ppm for source plume temperatures of 270 C and about 290 ppm for temperatures of 170 C. Field tests at both oil- and coal-burning power plants indicate that remote measurements agree with extractive data to within + or - 25% over SO2 concentrations ranging from 150 ppm to 1300 ppm from slant ranges of 130-400 m. (Author abstract modified)

53615 **APTIC NO. 78385**

Begnoche, B. C. and T. H. Risby

DETERMINATION OF METALS IN ATMOSPHERIC PARTICULATES USING LOW-VOLUME SAMPLING AND FLAMELESS ATOMIC ABSORPTION SPECTROMETRY. *Anal. Chem., 47(7):1041-1045, June 1975. 33 refs.*

The determination of metals in atmospheric particulates using low volume sampling and flameless atomic absorption spectrometry is described. The following metals are analyzed: aluminum, calcium, cadmium, cobalt, chromium, iron, magnesium, manganese, nickel, lead, and zinc. Sampling is accomplished by using porous polymer filters (47 mm) of different pore sizes and the analysis of the collected particles is performed by flameless atomic absorption spectrometry. Methods for increasing the reproducibility and for reducing the background contribution of the blank are discussed. Results are reported from a typical industrial source and from a rural area. (Author abstract modified)

53616 **APTIC NO. 77747**

Bergman, I.

ELECTROCHEMICAL CARBON MONOXIDE SENSORS BASED ON THE METALLISED MEMBRANE ELECTRODE. *Ann. Occupational Hyg., vol. 18:53-62, 1975. 7 refs.*

The amperostat system for detecting and measuring carbon monoxide consists of an electrochemical cell with two metallized membrane electrodes and an auxiliary electrode in a control circuit. The metallized membrane electrode is made by evaporating or sputtering metal onto a non-porous but gas-permeable polymer membrane. It allows the electrocatalytic activation of carbon monoxide sensors to be controlled, and the activity to be maintained. Preliminary results from field and laboratory studies suggest that with ancillary equipment, such sensors have significantly improved capacity to measure carbon monoxide at concentrations of 10 ppm upwards, and to measure it in a variety of gases; internal combustion exhaust gas, flue gases, cigarette smoke, exhaled air, polluted air, and air from environments subject to spontaneous combustion. They are useful in field situations requiring continuous monitoring, where their low fuel consumption is a major advantage. (Author abstract modified)

53617 **APTIC NO. 77890**

Bernstein, David, Michael T. Kleinman, Theodore J. Kneip, Tai L. Chan, and Morton Lippmann

DEVELOPMENT OF A HIGH-VOLUME SAMPLER FOR THE DETERMINATION OF PARTICLE SIZE DISTRIBUTIONS IN AMBIENT AIR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.3.)*

A size selective particle sampler has been developed for continuous sampling of the urban aerosol over periods ranging from hours to weeks. It uses a parallel array of two-stage samplers. The cyclones used as the first stage collectors have 50% particle retention at 3.5, 2.5, 1.5, and 0.5 micron aerodynamic diameter, respectively. Undersize particles passing through the cyclones are captured on glass fiber filters. Equal intake velocities are assured by flow equalizers on the inlets to the cyclones. Accurate control of the flow through the cyclones is obtained using an integrated circuit pressure transducer in conjunction with a specially designed feedback control circuit. The collection efficiencies of the cyclone were calibrated using monodisperse ferric oxide test aerosols tagged with Tc-99m. Mass balances of the particulates collected on the cyclones and filters are obtained for the five sampling stages. The sampler was operated in New York City for periods of 1 wk at rooftop level (13 stories). The concentrations in micrograms/cu m of the total suspended particulates measured by the particle size sampler are in excellent agreement with a constant flow sampler operating at the same site over the same sampling period. By taking the differences in the measured concentrations in each of the following particle size regions are obtained: less than 0.5 micron; 0.5 to 1.5 micron; 1.5 to 2.5 micron; 2.5 to 3.5 micron; greater than 3.5 micron. A bimodal distribution of the aerosol is observed. The distribution of lead, zinc, and manganese with particle size were determined by analyses of the filter samples and are discussed. (Author abstract modified)

53618 **APTIC NO. 77828**

Bethea, Robert M. and Philip R. Morey

AN ENGINEERING ANALYSIS OF THE RESPIRATORY AND TOTAL DUST PROBLEMS ASSOCIATED WITH COTTON TEXTILE PROCESSING OPERATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-20.2.)*

Results from an experimental comparison of several total and respirable dust concentration sampling techniques under simulated cotton textile processing conditions are presented. The methods evaluated are: the Environmental Protection Agency-type high volume sampler for total dust, the Occupational Safety and Health Administration-type vertical elutriator for total and respirable cotton dust, and the Andersen multistage cascade impactor for the determination of dust size distribution. The total dust monitor of the vertical elutriator must be mounted at the same height as the entrance to the elutriator cone if particle size distributions comparable to the standard high volume sampler are to be obtained. Inconsistent results are obtained with the verticle elutriator at flow rates of 6.8-7.5 l/min; at reduced flows of 3.8-4.2 l/min, reproducibility of the data is excellent, however. The cumulative particle size distributions obtained by the Andersen and high volume samplers are identical within experimental error for airborne emissions from carding strict middling cotton Very good agreement is also obtained for good middling cotton carding emissions. The Andersen units consistently yield total dust concentrations 40% lower than the corresponding results from the standard high volume sampler. Multistage cascade impactors appear to be of limited utility in cotton dust sampling. (Author abstract modified)

53619 **APTIC NO. 77737**

Bossart, Clayton J.

A LOW PARTS PER MILLION HIGHLY SELECTIVE CATALYTIC OXIDATION ANALYZER FOR CARBON MONOXIDE IN AMBIENT AIR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 4z refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.8.)*

A selective catalytic oxidation analyzer was developed with a detectability limit of 100 ppb carbon monoxide in air. The detection principle is based on the heat of combustion of CO on Hopcalite (R) catalyst. The instrument features a completely automatic self-regenerative sample transport, conditioning, and scrubbing system which obviates the normal cross interference effects of other components in the air and allows stable operation at high sensitivity. A description of the instrument system, including other operational features, is presented. Operation specifications and data from evaluation tests are included. (Author abstract modified)

53620 **APTIC NO. 78217**

Bourbon, P., J. Alary, J. Esclassan, and J. C. Lepert

DETERMINATION OF NO2 AND NO AT VARIOUS CONCENTRATIONS, USING COLORIMETRY AND CHEMILUMINESCENCE. *(Dosages du dioxyde et du monoxyde d azote a differentes concentrations par colorimetrie et par chimie-luminescence). Text in French. Analusis, 3(4):217-220, April 1975. 8 refs.*

Chemiluminescence was compared with the Griess-Saltzman colorimetric method for estimating nitric oxide and nitrogen dioxide at concentrations ranging between 0.02 and 600 ppm. Chemiluminescence yielded theoretical results below 1 ppm NO2 (permeation tube source), whereas the colorimetric method produced results 25% too low. At higher NO2 concentrations a modification of the Griess-Saltzman method showed good agreement with chemiluminescence.

53621 **APTIC NO. 77756**

Breslin, John A. and Richard L. Stein

EFFICIENCY OF DUST SAMPLING INLETS IN CALM AIR. *Am. Ind. Hyg. Assoc. J., 36(8):576-583, Aug. 1975. 5 refs.*

Tests were conducted to determine the conditions of particle size, inlet radium, and flow rate necessary for accurate dust sampling. A coal dust aerosol was sampled simultaneously through inlets of different diameters at the same volume flow rate and collected on filters. The dust was removed from the filters and the particles were counted and sized with a Coulter counter. Published criteria for inlet conditions for correct sampling are overly restrictive. The respirable size particles are sampled correctly in the normal range of operation of most dust sampling instruments. (Author abstract modified)

53622 **APTIC NO. 77921**

Brown, H. M. and H. R. Krouse

DEVELOPMENT OF A HIGH VOLUME SAMPLER FOR GASEOUS AND PARTICULATE SULPHUR COMPOUNDS IN THE ATMOSPHERE. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 50-57. 4 refs. (Jan. 16-17.)*

A high volume air sampler was modified to collect sulfur compounds from the atmosphere. Various filter packs have been used to retain particulate sulfate and sulfur, and chemically impregnated papers have absorbed gaseous compounds. Glass filters appear to satisfactorily entrap particulates while impregnation with potassium hydroxide-triethanolamine and zinc acetate solutions have been used for collection of sulfur dioxide. Sampling can be carried out successfully at temperatures as low as -10 C. The instrument provides concentration data which are useful for elucidating the fate of sulfur emissions. (Author abstract)

53623 **APTIC NO. 78357**

Bunn, W. W., E. R. Deane, D. W. Klein, and R. D. Kleopfer

SAMPLING AND CHARACTERIZATION OF AIR FOR ORGANIC COMPOUNDS. *Water, Air, Soil Pollut., 4(3/4):367-380, July/Aug. 1975. 12 refs.*

Computerized gas chromatography/mass spectrometry was applied to the analysis of organic compounds in air at a National Air Surveillance Network station in Kansas City. Sampling approaches used include particulate sampling, adsorption on XAD-2 resin followed by solvent elution, and adsorption on Tenax GC followed by direct desorption onto a gas chromatography column. Eighty-two compounds were identified. Unusually large amounts of phenol and phenol-formaldehyde resin intermediates are found. They originate from the fiberglass industry where phenol-formaldehyde resins are used as binders. (Author abstract modified)

53624 **APTIC NO. 77729**

Chahal, Hardial and Donald C. Hunter

HIGH VOLUME AIR SAMPLER: AN ORIFICE METER AS A SUBSTITUTE FOR THE ROTAMETER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 4 refs. (Presented at the Air Pollution Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.5.)*

The use of an orifice meter instead of a rotameter for measuring air flow rate through high volume air samplers was investigated. The orifice meter was installed inside the cylindrical portion of the filter adapter. Superiority of calibration reproducibility of the orifice meter was established in laboratory studies by simultaneously calibrating the rotameter and the orifice meter five times against a Roots-Connersville positive rotary dry gas meter and then comparing the standard deviation of the constants in the respective equations derived from the calibration curves. The orifice meter also proved to be more accurate and at least as practical as the conventional rotameter during field tests. The orifice meter, once calibrated, does not need recalibration since it is well protected by virtue of its location inside the adapter throat. The orifice meter is ahead of the motor and is thus independent of it, permitting the meter to be used with any motor encountered in the field. (Author abstract modified)

53625 **APTIC NO. 77684**

Chaney, Lucian W., William A. McClenny, and Robert T. Ku

LONG PATH LASER MONITORING OF CO IN THE ST. LOUIS AREA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.6.)*

Long path integrated measurements of carbon monoxide were made at three locations in the St. Louis area using a tunable semiconductor diode laser system mounted in a mobile van. These measurements were compared to measurements obtained by collecting bag samples which were later measured by gas chromatography. Limited measurement comparisons were also made with regional Air Monitoring Stations and with a new correlation cell point monitor. The tunable semiconductor diode laser system can make integrated path measurements of CO over a total path up to 1 km for concentrations from 0.2 ppm to several ppm. The instrumentation performed reliably over an extended period. The ability to switch the beam from one retro-reflector to another in a few minutes is demonstrated. (Author abstract modified)

53626 **APTIC NO. 77759**

Chao, Ching-Ning, Shirley Lam Lee, Hui-Tuh Tsai, and Shaw-Chii Wu

A STUDY OF AIRBORNE PARTICLES BY EMISSION SPECTROGRAPHIC METHOD. *J. Chin. Chem. Soc., 22(1):69-76, March 1975. 9 refs.*

A rapid spectrographic method was developed to analyze cadmium, lead, nickel, zinc, tin, titanium and vanadium collected in glass fiber air filters. A direct excitation method is used for volatile elements while graphite powder is added for determining involatile elements such as Ti and V in a dc arc source. Limits of detection for analyzed elements are between 0.01-0.1 micrograms. This simple and sensitive method was used to analyze samples from 15 air sampling stations in different areas of Taiwan. (Author abstract modified)

53627 **APTIC NO. 77770**

Conrad, H., G. Ertle, J. Kueppers, and E. E. Latta

PHOTOELECTRON SPECTROSCOPY FROM CO ADSORBED ON A CU(III) SURFACE. *Solid State Commun., 17(5):613-616, Sept. 1975. 19 refs.*

The adsorption of carbon monoxide on a copper (III) surface was studied using photoelectron spectroscopy (UPS). The UPS spectra taken with helium II-resonance radiation (hv equals 40.8 eV) from a clean and a CO covered Cu(III) surface together with the corresponding difference spectrum is illustrated. The essential changes after adsorption of CO are strong damping of the emission from the d-band, and two peaks at -8.5 and -11.6 eV followed by a shoulder centered at around -13.5 eV. The emission from the Cu d-band is markedly suppressed after adsorption. The results are discussed in terms of the recent models for assigning the UPS peaks observed after adsorption of CO on transition metals. (Author abstract modified)

53628 **APTIC NO. 77972**

Cooper, Douglas W.

DIFFUSION BATTERY DATA INVERSION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-41.2.)*

Equations describing the penetration (or transmission) of an aerosol through a diffusion battery and through an impactor are derived and used to form sets of linear equations relating the instrument data to the input distribution and the instrument response. The linear equations are written equivalently as a matrix transformation of a vector. The magnitude (norm) of the inverse of this matrix is shown to be a measure of error if the data are taken at face value. The inverse of the matrix is also known to be a measure of the magnification of error if the data are subjected to data inversion. Computer calculations of the inverse matrix show that the impactor much more precisely measures particle size than does a diffusion battery, using either equal sizing intervals or sizing intervals which increase geometrically. For more than two size intervals, the norm of the inverse matrix for the diffusion battery is 100 or larger, casting doubt on its use for size (mobility) determination. (Author abstract modified)

53629 **APTIC NO. 77728**

Deyo, J., J. Toma, and R. B. King

DEVELOPMENT AND TESTING OF A PORTABLE WIND SENSITIVE DIRECTIONAL AIR SAMPLER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.4.)*

A portable wind sensitive directional particulate air sampler is described. The system is designed to identify sources of air pollution on the directional collection of field air samples and their analysis for suspended particulates and trace element characteristics. Air samples are collected on filter slides using a standard high volume air sampler drawing air through a porting arrangement which tracks the wind direction and permits collection of discrete samples. A preset timer controls the length of time each filter is in the sampling position. At the conclusion of the sampling period, a new filter is automatically moved into the sampling position, thereby displacing the previous filter to a storage compartment. Thus, the sampler may be set up in the field and left to acquire air samples automatically at any timer interval from 1-30 hr. (Author abstract modified)

53630 **APTIC NO. 77668**

Dolan, William P.

GAS CHROMATOGRAPHIC ANALYSIS OF ORGANIC EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-33.4.)*

The principles of gas chromatography are reviewed as they apply to the separation of components found in air pollutant emissions. Gas chromatography can be divided into two major categories, gas-solid chromatography and gas-liquid chromatography. The sorbent in GSC is a solid of large surface area, while in GLC the sorbent is a non-volatile liquid coated on an inert solid support. The moving gas phase or carrier gas is an inert gas such as nitrogen or helium which is made to flow at a constant rate through a packed column. The packed column consists of a small diameter tube composed of such materials as stainless steel, glass, or teflon. Each component of the sample to be analyzed emerges in time from the end of the column as a binary mixture with the carrier gas. Examples of this process are illustrated for the separation of natural gas into its components (ethane, propane, nitrogen, and butanes) and the identification and separation of isobutane and normal butane isomers.

53631 **APTIC NO. 77686**

Dowd, G., G. Corte, and J. L. Monkman

A MERCURY VAPOR DETECTOR BASED UPON THE AUTOMATIC ADJUSTMENT OF LAMP INTENSITY TO THE MERCURY CONCENTRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.4.)*

A mercury measuring system is described which controls the ultraviolet lamp intensity, usually considered as a source of serious difficulty. Zero and span become directly related to the reference voltage. Calibration curves cover a range from 0.5 to 350 micrograms of Hg/cu m. They are stable as to span and zero for at least 2 mo. The cell constant is measured at 0.000636 for the 31 cu cm effective optical volume used in the instrument. It is valid as long as the lamp current is between 0.5 and 4 milliamperes. Although the device exhibits no direct temperature dependence, it is necessary to supply the ultraviolet lamp with 15 watts of external heating when used at 50 F and at lamp currents less than 0.8 milliamperes. (Author abstract modified)

53632 **APTIC NO. 77659**

Dravnicks, A., W. H. Prokop, and W. R. Boehme

MEASUREMENT OF AMBIENT ODORS USING DYNAMIC FORCED CHOICE TRIANGLE OLFACTOMETER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1965. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-55.5.)*

The measurement of ambient odors using a dynamic forced choice triangle olfactometer is discussed. Samples are taken in 18 liter Teflon bags and expelled into a dynamic triangle olfactometer equipped with five dilution levels. Three sniffing ports at each level are provided. Panelists indicate which port was different in odor. No significant loss of odor was observed in sampling and in storage of rendering odors up to 48 hr. Ambient odor measurements in the field with the Scentometer rank correlate satisfactorily with dynamic olfactometer measurements on bag samples for an experienced panel, but not for novices. (Author abstract modified)

53633 **APTIC NO. 77730**

Eisinger, Ronald S.

ATMOSPHERIC HYDROGEN SULFIDE MEASUREMENT USING A SILVER NITRATE- BASED TAPE SAMPLER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa. 23p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.1.)*

The construction and operation of a sensitive hydrogen sulfide analyzer that is capable of automatic, unattended operation is described. A prototype tape sampler using paper tape impregnated with silver nitrate and giving better specificity than that attained by commercially available H2S tape samplers was built. The increase in optical density of the paper tape is proportional to the concentration of H2S, and a detectability limit of 0.25 ppb H2S for a t-hour sampling interval is achieved.

Neither humidity, ozone, nor the prefilter affects measurement. Methyl mercaptan, when mixed with H2S, interferes. During 2 wk of continuous monitoring adjacent to a Los Angeles freeway in Sept., 1974, an average of 0.35 ppb H2S was measured. Concentrations of H2S do not correlate with automotive emissions. While the diurnal variation of H2S is similar to that of sulfur dioxide and sulfate, the sources of H2S seem more widespread. During daytime, usually no more than 5% of the total gaseous sulfur was H2S. (Author abstract modified)

53634 **APTIC NO. 77915**

Fatemi, M., E. T. Johnson, J. V. Gilfrich, and L. S. Birks

QUANTITATIVE MEASUREMENT OF POLLUTANT ASBESTOS: PART II. SAMPLE PREPARATION TECHNIQUES AND TYPICAL RESULTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 1 ref. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-50.7.)*

A sample preparation technique for the measurement of airborne asbestos by X-ray diffraction or electron microscopy is described. Standard asbestos fibers are broken down by sonication to 1-2 micron lengths using a high powered ultrasonic cell disrupter. Following filtration and ashing, they are dispersed in a special alignment medium and are electrostatically aligned using a two-dimensional multielectrode alignment stage. After evaporation of the alignment medium, a layer of parlodion (cellulose nitrate) is sprayed on the stage in which the aligned fibers are embedded. The substrate can be stripped off the alignment stage and mounted over a ring. The sample is placed perpendicular to the broad beam and is rotated in its own plane by 90 deg. X-ray diffraction data corresponding to the signal- plus-background and background-alone positions are recorded. Preparation of most air samples does not require high-powered sonication because of the inherently small fiber sizes. Thus an X-ray diffraction sample can be subsequently analyzed by electron microscopy is desired. Typical measurements on standard and simulated air samples indicate minimum detection limits of better than 0.15 micrograms and better than 0.4 micrograms for 500 sec of counting time. (Author abstract modified)

53635 **APTIC NO. 77941**

Fegley, M. J., D. S. Ensor, and L. E. Sparks

THE PROPAGATION OF ERRORS IN PARTICLE SIZE DISTRIBUTION MEASUREMENTS PERFORMED USING CASCADE IMPACTORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1975., 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-32.5.)*

A fundamental error analysis in particle size distribution measurements performed using cascade impactors was conducted. The effects of flow condition fluctuations and construction tolerances are analyzed using the solutions of differential equations describing the deposition efficiency of a round hole jet impactor. The important sources of random error are the weighting of the particle deposits, the tolerance in drilling the jet holes, and the variation in flow rate through the impactor. The difficulty of generalizing the error analysis and the need to apply to specific situations are stressed. These errors are controlled by using an analytical balance with the best precision available and with good quality control of the impactor construction. Careful size determination is best achieved by calibrating the impactor with a test aerosol. (Author summary modified)

53636 **APTIC NO. 77748**

Firth, J. G., A. Jones, and T. A. Jones

SOLID STATE DETECTORS FOR CARBON MONOXIDE. *Ann. Occupational Hyg., 18(1):63-68, 1975. 4 refs.*

The mechanism by which adsorption of a gas can produce an electrical conductivity change in a semiconductor is outlined. The attendant advantages and disadvantages of the use of metal oxide semiconductors in solid state detection devices for carbon monoxide are described, and ways of reducing the disadvantages discussed. Devices using metal oxide semiconductors can produce large signals in low concentrations of many gases, and can be cheaply manufactured and powered, and compactly designed. The major disadvantage is the lack of detection specificity in mixtures of several gases. Technical design methods for improving sensor specificity are discussed. (Author abstract modified)

53637 **APTIC NO. 77663**

Franklin, M. E., R. O. Blosser, A. L. Caron, A. K. Jain, and W. J. Gillespie

LABORATORY AND FIELD STUDY OF REDUCED SULFUR SAMPLING AND MONITORING SYSTEMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75.34.4.)*

Laboratory and field studies on the sampling and monitoring of reduced sulfur compounds (hydrogen sulfide, methyl mercaptan, methyl sulfide, and dimethyl disulfide) are reported. Near quantitative transfer of reduced sulfur compounds from kraft recovery furnaces and lime kilns can be achieved by the use of an all glass-teflon system. A sampling system consisting of a teflon probe, condenser, heat-traced sample line, small drop-out bottle, and citric acid sulfur dioxide scrubber can convey a sample over a 1-month period from the recovery furnace to a continuous monitor with no more than a 0.5 ppm H2S loss. Field installations may require the use of a backflush system to maintain long-term performance of near quantitative sample transfer. A system for monitoring lime kiln emissions with no more than a 5 ppm loss of H2S is also available. The system is similar to that employed in the recovery furnace with the addition of a water flush and air purge system. The conversion of reduced sulfur compounds in kraft recovery furnace and lime kiln gases to SO2 using a combustion furnace followed by the measurement of SO2 appears to be a viable monitoring approach for reduced sulfur compounds. (Author conclusions modified)

53638 **APTIC NO. 78393**

Fraust, Charles L.

THE USE OF ACTIVATED CARBON FOR SAMPLING INDUSTRIAL ENVIRONS. *Am. Ind. Hyg. Assoc. J., 36(4):278-284, April 1975. 12 refs.*

Commercial techniques for analyzing organic contaminants in production areas at a large semiconductor manufacturing plant are discussed. Activated carbon is used in the sampling procedure as the collection medium. Vapors of a number of common industrial solvents are absorbed and collected on the activated C surface at concentrations in the ppm and sub-ppm range. Analyses of the collected samples, stripped from the C surfaces with carbon disulfide are performed by gas chromatography using a number of different column packings. A gas chromatograph-mass spectrometer system is used to separate and then identify individual constituents. Other related applications of activated C sampling are reported. (Author abstract modified)

53639 **APTIC NO. 77894**

Fyock, David H., Henry H. Blau, Jr., Edward W. Fasci, Paul L. Kebabian, John R. Kruse, and Richard Weiser

TEST OF THE ENVIRONMENTAL RESEARCH AND TECHNOLOGY STACK GAS ANALYZER AT THE CONEMAUGH GENERATING STATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-60.6.)*

A nondispersive infrared instrument designed for continuous cross stack monitoring was used to analyze flue gases for sulfur dioxide, nitric oxide, carbon monoxide and carbon dioxide. The site of the test was a coal fueled electric generating station. Measurements made by the analyzer were compard with data calculated from analysis of the coal. The stack monitor proved to be very reliable for measuring all four gases. (Author abstract modified)

53640 **APTIC NO. 77644**

Garcia, Alberto M., Ronald L. Ketchum, and Edward G. Howard

EPA EQUIVALENCY PERFORMANCE OF A TUNED SECOND DERIVATIVE AMBIENT MONITOR FOR SO2. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.8.)*

A tuned second derivative spectrophotometer for continuous ambient sulfur dioxide monitoring was tested according to Environmental Protection Agency specifications. The noise during seven tests of the instrument was less than the 0.005 ppm specification, and the lower detectable limit of the monitor was more than twice the highest noise level during each of the tests. All 24-hour drift values were within the required parameter values. The instrument also showed excellent span stability. Interference from nitric oxide, nitrogen dioxide, ozone, or xylene on SO2 measurements was not observed at levels required by EPA specifications. The second derivative measurement technique is based on wavelength modulation of the light source, and use of wavelength modulation results in increased specificity and the elimination of the effects of broadband absorption and particulate scattering.

53641 **APTIC NO. 78053**

Grams, G. W., E. M. Patterson, and C. M. Wyman

AIRBORNE LASER RADAR FOR MAPPING TWO-DIMENSIONAL CONTOURS OF AEROSOL CONCENTRATION. *Opt. Quantum Electron., 7(3):187-191, May 1975. 7 refs.*

An airborne laser radar system for mapping two-dimensional contours of aerosol concentration is described. The system includes a compact dye laser with real-time data analysis capability. The organic dye used in the laser is Rhodamine 5 RBL which is circulated through a filter to remove oxidation products and thus prolong the useful life of the dye solution. The flashlamp and capacitor spark-gap drive system is a commercially available system which produces laser pulses of approximately 0.5 microseconds duration. The output of the laser passes through a beam director which includes another beam expander to improve the collimation of the output beam and is transmitted coaxially with the receiver optics. An externally mounted mirror system on the aircraft directs the field of view of the coaxial transmit/receive unit either upward or downward so that two-dimensional contours of aerosol concentration can be mapped out above or below the aircraft.

53642 **APTIC NO. 77683**

Guinivan, Thomas L., Robert Goldberg, and Richard M. Tuggle

FIELD TESTING THE SCARINGELLI AND THOMPSON AMBIENT MERCURY METHODS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.7.)*

The concentrations of airborne mercury were measured at Joliet Army Ammunition Plant (AAP) using three existing air monitoring stations. Sampling was conducted for 8 continuous days and the maximum Hg concentration is 0.3 micrograms/cu m. Nine parallel samples were analyzed by the Environmental Protection Agency Central Regional Laboratory in Chicago and their results show generally lower concentrations of Hg, but within the limits of error of the analytical method. There is an airborne Hg source in Wilmington, Ill., to the south of Joliet AAP boundaries as the concentrations measured at the southernmost sampling station are generally highest. (Author abstract modified)

53643 **APTIC NO. 75936**

Hamil, Henry F., Richard E. Thomas, and Nollie F. Swynnerton

EVALUATION AND COLLABORATIVE STUDY OF METHOD FOR VISUAL DETERMINATION OF OPACITY OF EMISSIONS FROM STATIONARY SOURCES (TASK ORDER). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0626, Program Element 1HA327, ROAP 26AAG, Rept. EPA-650/4-75-009, SwRI 01- 3462-006, Jan. 1975. 3 refs.*

A collaborative evaluation of a visual method for determining the opacity of emissions from stationary sources (Environmental Protection Agency Method 9 (Visual Determination of Opacity)) was performed. The determinations were based on 25 readings made by qualified observers using smoke generators or stationed at a sulfuric acid plant and at a coal-fired power plant. Composite precision estimates were obtained using the estimates from all tests at each site. The estimated within-observer standard deviation was 2.05% opacity with 693 degrees of freedom. The estimated observer bias standard deviation was 1.29% opacity with 44 degrees of freedom, and the composite between-observer standard deviation was 2.42% opacity. The estimates show a reasonable degree of accuracy and precision for the method when used in the probable range of opacities that occur in field use (0-35% opacity). (Author abstract modified)

53644 **APTIC NO. 77771**

Harrison, N.

A REVIEW OF TECHNIQUES FOR THE MEASUREMENT OF CARBON MONOXIDE IN THE ATMOSPHERE. *Ann. Occupational Hyg., 18(1):37-44, 1975. 24 refs.*

Techniques for the measurement of carbon monoxide in the atmosphere are reviewed. The choice of a method depends on the availability of the apparatus and operations; time and accuracy; the number of determinations; the concentration of CO expected; other components in the sample; cost; reliability and maintenance; singularity of the sample; restrictions; and the use to which the information will be put. Available methods fall into nine categories: biological methods, gasometric methods, oxidation, other chemical methods, gas chromatography, mass spectrometry, infrared analyzers, detector tubes, and electrochemical sensors.

53645 **APTIC NO. 78138**

Harwood, Colin F., David K. Oestreich, Paul Siebert, and John D. Stockham

ASBESTOS EMISSIONS FROM BAGHOUSE CONTROLLED SOURCES. *Am. Ind. Hyg. Assoc. J., 36(8):595-603, Aug. 1975. 8 refs.*

The absolute efficiency of baghouses in reducing the emissions of the particles of asbestos was investigated. Emission testing was conducted at five asbestos processing plants where the emissions are controlled by baghouses. The mass removal efficiency frequently exceeds 99.00%. Membrane filter samples of the effluent were examined by optical and electron microscope. Despite the high mass efficiency, the number of fibers emitted, which were greater than 1.5 micron in length, is about 10 to the 4th power-10 to the 5th power fibers/cu m, while the number of fibers less than 1.5 micron is 10 to the 7th power-10 to the 8th power fibers/cu m. (Author abstract modified)

53646 **APTIC NO. 78174**

Hattman, Elizabeth A., Hyman Schultz, and John F. Smith

SOLID AND GASEOUS FUELS. *Anal. Chem., 47(5):85R-97R, April 1975. 322 refs.*

Methods of sampling, analyzing, and testing solid mineral and gaseous hydrocarbon fuels are surveyed. Methods of sampling and chemical and physical testing of coal, coke, and related materials include: the sampling and proximate analysis of moisture, volatiles, and ash; determining the composition of fuels by analysis of the combustion gases: carbon and hydrogen, oxygen, and total sulfur; and aspects of coking processes and coke testing such as carbonization, plastic properties, coke strength, reactivity, and density. The analysis of inorganic constituents in coal, coke, and ash includes mineral matter, coal dust monitoring and analysis, major and minor elements, and trace elements such as arsenic, beryllium, chromium, gallium, germanium, mercury, rhenium, scandium, and selenium. The review of gaseous fuels includes gas chromatography, sulfur compounds, water vapor, potentiometric and colorimetric methods, infrared and mass spectrometry, sampling, oxides of nitrogen, and standards.

53647 **APTIC NO. 77917**

Hester, Norman, Roy Evans, Charles Fitzsimmons, David Mage, and Monty Price

HELICOPTER PLATFORM AIR POLLUTION DATA. I. THE RAPS PROGRAM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-40.4.)*

Gaseous and particular air pollution data obtained from helicopter platforms during the Regional Air Pollution Study Program designed to develop and validate mathematical simulation models of atmospheric processes are presented. The helicopters are equipped to measure ozone, nitric oxide, nitrogen oxides, carbon monoxide, sulfur dioxide, and particulates. Instrumentation on separate helicopters are in agreement to within + or - 5% of their full scale readings. Examples of vertical profiles over St. Louis show the necessity of airborne measurements. The pollution profiles are extremely complicated over the city, showing at times a complex layering of the pollutant concentrations. An experiment involving repeated spirals at a location upwind of the city for 3.5 hr to investigate how the background concentration of air pollutants changes with time revealed almost no change for NO and NOx and only small changes in concentrations of O3. (Author abstract modified)

53648 **APTIC NO. 78080**

Hinds, William C. and Melvin W. First

CONCENTRATIONS OF NICOTINE AND TOBACCO SMOKE IN PUBLIC PLACES. *New Engl. J. Med., 292(16):844-845, April 17, 1975.*

Levels of tobacco smoke were estimated in public places using nicotine as a tracer to evaluate the health implications for nonsmokers. Twenty-three samples were taken in the Boston area during 1973 and 1974 in commuter trains and buses, bus and airline waiting rooms, and restaurants and lounges. The tobacco smoke concentrations often exceed the annual average air quality standard for clean air. Annoyance from tobacco smoke is caused by factors other than the average concentration of particulate matter in the indoor atmosphere. Gaseous components represent approximately 70% of the mass combustion products in sidestream smoke and include strong irritants and unpleasant odors, such as phenols, aldehydes, and organic acids. Awareness of tobacco smoke is enhanced because its submicrometer particle size produces a highly visible aerosol at low mass concentrations.

53649 **APTIC NO. 77880**

Hogan, Austin W.

CALIBRATION OF PHOTO ELECTRIC NUCLEUS COUNTERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-62.2.)*

The photo electric nucleus counter provides rapid measurement of the concentration of submicron particles in gaseous media. It is an analog device that produces an electric current proportional to the number concentration of particles originally present, and therefore must be calibrated with some type of absolute aerosol detector. Several recent, and historic calibrations, are described. The comparison of aerosol detectors is primarily limited in accuracy by sampling and transmission errors. Great improvements must be made in the understanding of transmission and diffusion losses of submicron particles before the accuracy of calibration of aerosol detectors can achieve errors of + or - 10% or less. (Author abstract modified)

53650 **APTIC NO. 78131**

Homolya, James B.

CURRENT TECHNOLOGY FOR CONTINUOUS MONITORING OF GASEOUS EMISSIONS. *J. Air Pollution Control Assoc., 25(8):809-814, Aug. 1975. 8 refs.*

Current technology for continuous monitoring of gaseous emissions is discussed including extractive and in-situ measurements. Extractive source monitoring systems are available which either condition the sample and follow with a pseudo process analyzer measurement at source level concentrations or condition the sample by a dilution network coupled with an ambient air level instrument. Recent developments include: a reflux filtration which provides a low maintenance monitoring system by incorporating a reflux probe and a permeation distillation dryer; dilution interface systems based on the use of semi permeable polymers which permeate the pollutant at a rate higher than the permeability of water vapor or on mechanical aliquot sampling a controlled flow procedures; an instrument for sulfur dioxide measurement based on pulsed ultraviolet fluorescence, and the use of piezoelectric sorption detectors for pollutant measurement. A multi-pollutant in-situ method was developed based on gas cell correlation techniques. The instrument includes several absorption lines so that the gas in the correlation cell has large fluctuations in transmittance at different wavelengths.

53651 **APTIC NO. 78011**

Johnson, D. A. and D. H. F. Atkins

AN AIRBORNE SYSTEM FOR THE SAMPLING AND ANALYSIS OF SULPHUR DIOXIDE AND ATMOSPHERIC AEROSOLS. *Atmos. Environ., 9(9):825-829, Sept. 1975. 12 refs.*

An airborne system for the sampling and analysis of sulfur dioxide and particulate sulfate is described. The air sample is drawn through a high efficiency filter to first remove particulate matter and then through a filter paper impregnated with alkali and humifactant to trap SO2. Both SO2 and sulfate are subsequently determined as sulfate using the colorimetric thoronol method. Laboratory and field tests indicate that concentrations can be determined to within 2-3 micrograms/cu m for a 0.5 cu m sample (obtained in about 10 min). The system can also be used to determine ammonium and nitrate ion concentrations of atmospheric aerosol and shows the potential of being extended to include a wider range of trace elements.

53652 **APTIC NO. 77999**

Kalika, Peter W., Paul T. Bartlett, Robert E. Kenson, and John E. Yocom

MEASUREMENT OF FUGITIVE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, An-*

nual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75e25.3.)

Methods for measuring fugitive particulate and gaseous emissions from various industrial sources are discussed. The three basic measurement approaches being investigated in laboratory and field tests are: the quasi stack method in which the fugitive emission is temporarily hooded and a temporary duct or stack and fan are installed to permit sampling by means of standard stack sampling methods; the monitoring of roof and other vent openings to determine air and material balances through these openings; and outdoor sampling during prescribed meteorological conditions using sampling grids upwind and downwind of the source. A cost-effectiveness analysis of sampling strategy/industry source combinations indicates that the cost-effectiveness of a given sampling strategy is dependent on the source to be tested. A quasi-stack strategy is most cost effective for a single source such as a grey iron cupola; whereas a roof monitoring program is preferred for a copper smelter converter building, for example. A list of 18 industry/process combinations that are potentially significant fugitive emission sources is provided. (Author abstract modified)

53653 **APTIC NO. 77953**

Karels, Gale G., Cary R. Kendall, Thomas E. Perardi, and Dario A. Levaggi

USE OF REAL-TIME CONTINUOUS MONITORS IN SOURCE TESTING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 19 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-19.5.)*

The use of real-time continuous monitors for source testing in the Bay Area Air Pollution Control District is discussed. The instruments are mounted in mobile vans which are driven to the test site. Currently, the instruments are being used to monitor nitrogen oxides, sulfur dioxide, carbon monoxide, carbon dioxide, hydrocarbons, hydrogen sulfide, and oxygen through a common extractive sampling system. The advantages of using real-time continuous monitors rather than wet chemical or manual methods include the possibility of determining control settings to minimize emissions and the ability to conduct rapid screening tests to determine if time-consuming wet chemical tests are required. Data are presented illustrating the application of instrumentation to various test situations. Examples include: an NOx versus load curve for a large fossil fuel fired power boiler, a recorder trace showing the cyclic nature of a reverse flow glass furnace, and dynamic tune-up data for asphalt concrete hot-mix plants. (Author abstract modified)

53654 **APTIC NO. 78105**

Kozhenkov, V. I. and N. A. Fuchs

DETERMINATION OF THE DROPLET SIZE DISTRIBUTION IN COARSE FOGS BY MEANS OF THE MICRODIFFRACTION METHOD. *J. Colloid Interface Sci., 52(1):120-121, July 1975. 1 ref.*

A method is described for the determination of droplet sizes with radii less than or equal to 1.5 micron in fogs, based on deliberately photographing the droplets that are outside the camera focus under monochromatic laser illumination. The fog is passed through a small chamber with blackened walls and with holes for the laser rays and for photographing. A dye laser emitting partially polarized light is used. The droplets that are sufficiently outfocused give large light diffraction spots crossed by a row of dark parallel stripes corresponding to the minima on the central part of the scattering curves of the droplets. The number of stripes on the spots is independent of the distance between the droplets and the camera. The number of the stripes on diffraction spots was proportional to the radius of the droplets fo droplets with radii between five and 20 micron. Photographs of the droplets with a radius of 10 micron taken at various light wavelengths from 0.4 to 0.67 micron showed the number of stripes to be inversely proportional to the wavelength. A proportionality constant was found.

53655 **APTIC NO. 77685**

Ku, T. T., E. D. Hinkley, and J. O. Sample

LONG-PATH LASER MONITORING OF ATMOSPHERIC POLLUTANT GASES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.5.)*

An ambient air monitoring system incorporating a tunable semiconductor diode laser was developed for integrated path measurements of pollutant gases in the atmosphere by the technique of resonance absorption in the infrared. Low-power infrared laser radiation is propagated to a remote retroreflector, and the return beam is analyzed as the laser is tuned to a specific absorption line of the gas to be detected. Ambient air measurements of atmospheric carbon monoxide over path lengths to 1 km, with a sensitivity of a few ppb, are reported. The monitoring system is incorporated into a mobile van; and details of the tunable laser, optics, measurement and calibration procedure, and techniques employed to overcome effects of atmospheric turbulence are given. Potential errors due to laser multi-moding, low power return, interferences, and zero drift are discussed. (Author abstract modified)

53656 **APTIC NO. 78015**

Kulkarni, R. N.

MEASUREMENTS OF NO2 USING THE DOBSON SPECTROPHOTOMETER. *J. Atmospheric Sci., 32(8):1641-1643, Aug. 1975. 8 refs.*

A method of measuring atmospheric nitrogen dioxide with a Dobson spectrophotometer is described. The wavelengths 4377 and 4448 A show strong differential absorption by NO2, and their intensity can be measured by suitably changing the inclination of the Q-quartz plates to the direction of the light ray. An average NO2 mixing ratio, which is of the order of 10 to the -9 for Aspendale, Victoria, Australia, is obtained by using appropriate absorption coefficients of NO2. The measurement uncertainty can be reduced to 50% or less by accurately determining extraterrestrial constants and Q-plate settings, thus allowing for average background nitrogen oxide measurements to be made. (Author abstract modified)

53657 **APTIC NO. 78096**

Kuroda, D.

PRESENT SITUATION AND PROBLEMS OF THE NITROGEN OXIDES DETERMINATION METHOD. *(Chisso sankabutsu sokutei o no genjo to mondaiten). Text in Japanese. Kagaku to Kogyo (Chem. Ind.), no. 8:1-11, Aug. 1975. 16 refs.*

New and actual JIS measurement methods for nitrogen oxides are quite different from the old JIS methods established in May 1968. Various instrumental analysis methods (continuous analysis method) are part of the new JIS method. Chemical analysis methods include the Saltzman method for nitrogen dioxide and the phenol disulfonic acid method, quick phenol disulfonic acid method, zinc reduction naphthyl ethylenediamine method and nitrate ion electrode method for nitric oxide and NO2. Continuous analysis methods include the chemiluminescence method, infrared absorption spectroscopy and ultraviolet absorption spectroscopy for NO, ultraviolet absorption spectroscopy and coulometry for NO2 and coulometry (oxidation method, reduction method, and cumulative output method) for NO and NO2.

53658 **APTIC NO. 77724**

Kurtz, Jerome L. and John G. Olin

A NEW FLOW CONTROLLER FOR HIGH VOLUME AIR SAMPLERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.6.)*

A constant flow controller for high volume particulate samplers is described. The device uses a constant-temperature thermal anemometer which measures the mass flow of the sampled air. A triac motor speed regulator in a feed-back control loop maintains the flow rate constant over the selectable range of 20-60 standard cu ft/min. The flow rate error caused by filter loading, temperature variation, line voltage changes, change of filters and motor brushes, and the installation of a top-loading calibrator is at most 1.1 standard cu ft/min. (Author abstract modified)

53659 **APTIC NO. 77950**

Kutyna, Andrew G., Rodney A. Schmall, Andre L. Caron, and Russell O. Blosser

A COMPARISON OF SOURCE PARTICULATE MEASUREMENT PROCEDURES AT KRAFT RECOVERY FURNACES, LIME KILNS, SMELT TANKS, AND BARK-FIRED BOILERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-19.2.)*

A series of laboratory and field investigations to determine if the particle concentrations from certain point sources (recovery furnaces, lime kilns, smelt tanks, and bark-fired boilers) in a kraft pulp mill can be found by techniques other than Method 5 were conducted. At least 30 paired samples were collected for each of the four types of sources from five or more different pulp mills. In-stack filtration with a glass fiber filter was the alternate mode of particle capture when sampling moisture-unsaturated sources, while wet impingement capture was used on the moisture-saturated sources. In-stack filtration produced results essentially equivalent to those produced by the Method 5 front half. There was evidence that on cooling the gas stream from stack temperature to the Method 5 filter temperature, measurable amounts of sulfuric acid were condensed and trapped on the filter. Alternate sampling procedures for sources essentially void of sulfur dioxide but containing entrained water were found which can equivalent to Method 5. (Author abstract modified)

53660 **APTIC NO. 77994**

Lebowitz, Malcolm F.

SHORT TERM TESTING FOR FUGITIVE DUST EFFECT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-25.4.)*

Examples of short-term testing for fugitive dust emissions are provided. Gravitational separation is the basis of test site location; and two or more test locations, well beyond the heavy settling range, are designated as boundary sites. Another location near the source, within the heavy settling range, is the source site. Ambient air quality particulate matter concentrations are measured by the high volume method. The air sample is drawn through a filter situated in a covered housing at about 50 cu ft/min for approximately 24 hr. The data are tabulated in a two dimensional array to ascertain variations due to daily effects and locations. Suspended particulate concentrations are reported for areas around a wood products process, a cement plant, and one new and one existing steel plant. The tabulated data indicate concentrations greater than the national primary standard.

53661 **APTIC NO. 77764**

Lebron, Felipe

A COMPARISON OF WEEKEND-WEEKDAY OZONE AND HYDROCARBON CONCENTRATIONS IN THE BALTIMORE-WASHINGTON METROPOLITAN AREA. *Atmos. Environ., 9(9):861-863, Sept. 1975. 8 refs.*

A smog index related to dosage (ppm/hr) of ozone was derived using data from the Baltimore-Washington metropolitan area for the months of June-Sept. 1972 and 1973. On the average, weekends have higher indices than weekdays. The 06:00-09:00 hr average concentrations of non-methane hydrocarbons are significantly higher during weekdays than during weekends. No relationship exists between these morning hydrocarbon levels and the afternoon peak O3 concentration. There is some doubt on the effectiveness of early morning hydrocarbon emission control alone in an abatement program for photochemical oxidants. (Author abstract modified)

53662 **APTIC NO. 77757**

Lepp, N. W.

THE POTENTIAL OF TREE-RING ANALYSIS FOR MONITORING HEAVY METAL POLLUTION PATTERNS. *Environ. Pollut., 9(1):49-61, July 1975. 41 refs.*

The potential of tree ring analysis for monitoring heavy metal pollution patterns is discussed. Three direct pathways exist for heavy metal entry into trees: uptake from the soil via the roots with subsequent transport into woody tissue via the transpiration stream; foliar uptake with subsequent export from the leaf via the phloem, followed by lateral movement from this tissue into the xylem; and direct deposition onto stem surfaces followed by lateral movement across the bark and into the wood. Lateral exchange of heavy metals occurs between bark and wood which is an important factor in determining heavy metal levels in an annual growth ring. The following areas require investigation before tree ring analysis can be used as a pollutant indicator: transport form of metals in xylem, and the nature and seasonal variation of their organic ligands; the rate and magnitude of metal binding to xylem tissue in relation to transport form, and rate of transport; and the presence or absence of appreciable lateral metal redistribution via the xylem rays. The way in which metal levels in annual growth rings reflect the biologically available proportion of heavy metals within the particular location where the tree is sited is unknown.

53663 **APTIC NO. 78161**

Lesny, Juraj and Juraj Tolgyessy

DETERMINATIONS OF AIR POLLUTANTS WITH THE ACCENT ON NUCLEAR CHEMICAL ANALYSIS. *(Stanovenie znecistenin ovzdusia s taziskom v nuklearnej chemickej analyze). Text in Czech. Chem. Listy, 69(7):703-729, 1975. 164 refs.*

Methods of air pollution analysis are discussed with emphasis on nuclear analytical methods. Some methods such as use of radioactive kryptonates in automatic analyzers, activation analysis, and X-ray fluorescence methods, are widely used in a variety of applications. Other methods are used to solve one specific problem such as sudden air pollution in the proximity of chemical plants and industrial centers.

53664 **APTIC NO. 77892**

Lilienfeld, Pedro

A NEW AMBIENT PARTICULATE MASS MONITOR USING BETA ATTENUATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 21 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.2.)*

A particulate mass monitor has been developed for the automated measurement of ambient aerosol concentrations, based on beta radiation attenuation of two concurrently collected filter samples, representing the total and the respirable size fractions. The instrument incorporates a high-flow rate sampling inlet, isokinetic secondary collection flow extraction, flow control by an upstream venturi-type critical nozzle, and a double-beta detection rotating head configuration permitting uninterrupted sample collection without time loss associated with beta counting. The instrument also incorporates a microprocessor especially programmed for this application, which performs all signal processing, control, timing, self-testing and computation functions. The ambient particulate monitor has been designed for maximum compatibility with typical telemetry systems used on air pollution monitoring networks with central computer data collection. Unattended operation for almost a full year for 1-hour sampling periods appears feasible. (Author abstract modified)

53665 **APTIC NO. 77841**

Lukacs, Joseph and Michael C. J. Beamish

COMPARATIVE OPERATING DATA FROM MANUAL AND AUTOMATIC SOURCE EMISSION METHODS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-60.3.)*

Two distinctly different types of continuous source emission monitors (CSEM) are discussed in terms of their relative merits and applications. One method is based on the direct measurement of stack effluent flowrate, CSEM (Velocity), whereas the other uses an indirect measurement of stack effluent flowrate based on two types of material balance CSEM (Material Balance). The statistical comparison of the data from the manual stack survey and the CSEM (Velocity) system shows that agreement within 10% is expected. Error analyses of the two methods indicates that the CSEM (Velocity) monitor is more consistent than the manual stack survey, although the probable minimum error in the stack survey is less than that in the CSEM (Velocity) monitor. The CSEM (Material Balance) system for thermal power plants is more accurate for both Canadian and United States legislation with the one possible exception of coal fired power plants in Canada. (Author summary modified)

53666 **APTIC NO. 77788**

Malissa, H. and M. Grasserbauer

THE SIGNIFICANCE OF PHYSICAL MICRO METHODS IN THE INVESTIGATIONS OF DUSTS. *(Die Bedeutung physikalischer Mikromethoden zur Untersuchung von Staeuben). Text in German. Mikrochim. Acta, (39):325-342, Sept. 1975, 32 refs.*

The significance of physical micro methods in the investigation of dusts is discussed. Emphasis is placed on the average composition of dusts, for the identification of individual dust components and substances, and for determining the morphology of dust particles.

53667 **APTIC NO. 77837**

Mamane Yaacov and Alexander E. Donagi

THE EFFECT OF SAMPLING LINE ON THE MEASUREMENT RESULTS OF SULFUR DIOXIDE - A CASE STUDY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975, 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-45.2.)*

The effects of sample lines on continuous measurements of sulfur dioxide concentration were investigated by comparing data obtained from 1969-1971 with SO2 data from 1971-1973 at two monitoring stations. During the first period, the sampling line used consisted of transparent polyethylene tubing installed on the outer wall of a three-level building, with the line being exposed daily to incoming solar radiation. During the second period, polypropylene tubing covered with a wider non-transparent black sheath was used. The average SO2 concentration during the first period at one station was 0.047 ppm as compared to 0.013 ppm during the second period, with the ratio of the difference being 3.6. A similar ratio of 3.5 (0.049 versus 0.014 ppm) was also observed at the second monitoring station when data from each monitoring period were compared. Neither meteorological conditions nor changes in source emissions accounted from the sharp drop in SO2 concentration from the first to the second period. Diurnal and yearly patterns in the first period showed a broad maximum around the warmest periods of the day and year, with minimums occurring during the early morning (winter). This unusual cycle disappeared in the second period when maximum concentrations were observed in the morning (winter) and late evening of each day. Lower concentrations were measured early in the morning and in the afternoon (summer). Sulfur dioxide sampling losses for various sampling lines were also investigated and revealed the need for more attention to the design of in-situ SO2 monitors. (Author abstract modified)

53668 **APTIC NO. 78388**

Marchant, G. Reed, Don B. Hales, and Gary L. Whatcott

DESIGN PHILOSOPHY OF AIR QUALITY SURVEILLANCE SYSTEMS. *ISA (Inst. Soc. Am.) Trans., 14(2):137-144, 1975, 2 refs. (Presented at the Mining and Metallurgy Group Symposium and Exhibited, Annual, 3rd, Duluth, Minn., June 10-11, 1974.)*

The design philosophy of the air quality surveillance systems which Kennecott Research is installing in the vicinity of its copper smelters in Arizona, Nevada, New Mexico, and Utah is discussed. These monitoring systems are part of supplementary control systems (SCS) that are utilized to ensure that short term ambient air quality standards are met. These systems use minicomputers as remote terminals. The interface between a terminal and the primary sensors is a specially designed input/output circuitry. The system is controlled by a centralized host minicomputer, which is connected to each of the remote stations via a telephone line communication network. Real time data is displayed on cathode ray tubes located at strategic locations in the plants. The system design philosophy is discussed from both a hardware and softwave point of view. The actual experience in design, development, and installation of the system is included. (Author abstract modified)

53669 **APTIC NO. 77778**

McCammon, Charles S., Jr., Patricia M. Quinn, and Richard E. Kupel

A CHARCOAL SAMPLING METHOD AND A GAS CHROMATOGRAPHIC ANALYTICAL PROCEDURE FOR CARBON DISULFIDE. *Am. Ind. Hyg. Assoc. J., 36(8):618-625, Aug. 1975, 8 refs.*

A charcoal sampling method and a gas chromatographic analytical procedure for carbon disulfide are described. The CS2 is absorbed on charcoal tubes, eluted with benzene, and quantitated with a gas chromatography equipped with a sulfur flame photometric detector. The sensitivity of this method is 1 microgram on a charcoal tube. The tubes are unaffected by short storage at elevated temperatures or by shipping under reduced pressures. Sampling under conditions of high humidity drastically reduces the collection efficiency of the charcoal tube for CS2 unless a desiccant (calcium sulfate) is used to precede the charcoal during sampling. The sampling efficiency of the charcoal tube for CS2 is unaffected by the presence of hydrogen sulfide or in atmospheres with elevated temperatures. The overall sampling and analytical accuracy of the method as determined is 6% with a relative standard deviation of 9%. (Author summary modified)

53670 **APTIC NO. 78381**

Moest, R. R.

HYDROGEN SULFIDE DETERMINATION BY THE METHYLENE BLUE METHOD. *Anal. Chem., 47(7):1204-1205, June 1975, 4 refs.*

Gas cylinders containing hydrogen sulfide concentrations of 10 ppm in hydrogen or helium were examined by the Methylene Blue method. The formation of Methylene Blue is carried out immediately following the H2S absorption. A total of 1.8 g of sodium hydroxide/l of absorption mixture was added to reach a pH of 10. The H2S concentration is determined in a given gas by bubbling only one particular volume of gas, 1 liter, through the absorption mixture. The concentration is read off directly from a graph where the H2S concentration in ppm is plotted vs. the slope of the family of curves for this particular volume.

53671 **APTIC NO. 77732**

Moskowitz, Howard R.

QUANTITATIVE ASSESSMENT OF ODOR INTENSITY AND ODOR NOXIOUSNESS THROUGH PSYCHOPHYSICAL SCALING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-55.1.)*

A procedure for the quantitative assessment of odor intensity and odor noxiousness is described. The method of magnitude estimation (ratio scaling) is used to relate odorant concentration to both odor intensity levels and perceived liking or disliking. The method is expanded to use descriptor terms for subjective intensity and hedonic tone. The results are functions which relate intensity and hedonics to concentration and descriptions of individual differences in odor perception. The method is applied for both the evaluation of odors, and as a stepping stone for the development of odor evaluation systems which require subjective odor evaluation. (Author abstract modified)

53672 **APTIC NO. 75943**

Mueller, Peter K., Arthur E. Alcocer, Ronald L. Stanley, and Glenn R. Smith

ASBESTOS FIBER ATLAS (FINAL REPORT). *California Dept. of Health, Berkeley, Calif., Air and Industrial Hygiene Lab., Environmental Protection Agency Research Grant 801336, Program Element 1AA010 (26AAN), Rept. EPA-650/2-75-036, AIHL 98, 57p., April 1975. 8 refs.*

NTIS: PB 244766/AS

An atlas of transmissioon electron micrographs and corresponding selected area electron diffraction patterns of standard specimens of serpentine and amphibole asbestos is presented for use by analysts as an aid in identification. Micrographs and diffraction patterns of typical ambient air samples of asbestos are also included along with certain minerals such as quartz that often occur with airborne asbestos. Specimens were uniformly prepared and examined in a single electron microscope. (Author abstract modified)

53673 **APTIC NO. 78048**

Mulik, M. Cooke, M. F. Guyer, G. M. Semeniuk, and E. Sawicki

A GAS LIQUID CHROMATOGRAPHIC FLUORESCENT PROCEDURE FOR THE ANALYSIS OF BENZO(A)PYRENE IN 24 HOUR ATMOSPHERIC PARTICULATE SAMPLES. *Anal. Lett., 8(8):511-524, 1975. 26 refs.*

A gas chromatographic-gas phase fluorescent method for the selective analysis of benzo(3-4)pyrene in 24-hour particulate samples is described. Benzo(3-4)pyrene is partially separated from the other polynuclear aromatic hydrocarbons in the sample via gas chromatography and is then completely resolved optically from traditionally difficult to resolve polynuclear compounds by means of a gas phase fluorescent detector. The gas chromatograph is fitted with a 6 ft by 1/4 in. glass column packed with a mixed stationary phase. The support used is high-performance Chromosorb W of 100-120 mesh coated with 6% Dexsil 300 and 6% Dexsil 400. The optimum fluorescence response for benzo(3-4)pyrene is found at an excitation wavelength of 360 nm and an emission wavelength of 404 nm. Ambient air concentrations as low as 20 picograms/cu m of air can be assayed with the procedure. (Author abstract modified)

53674 **APTIC NO. 77696**

Nader, John S.

PARTICULATE MASS MONITORING TECHNIQUES APPLIED TO EMISSION SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 28 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-60.2.)*

Two direct and two indirect methods of continuous monitoring of particulate emissions are reviewed as commercially available systems that are applied to some source emissions. The beta-gauge monitor (direct) and the opacity monitor (indirect) are used more than the piezoelectric monitor (direct) and the charge transfer monitor (indirect). A significant consideration is the relative cost of these systems. The beta-gauge system is in the range of $14,000 to $20,000. The other three systems range from $4000 to $8000. A beta-gauge system is presently available only as an extractive system but it has a sampling interface problem. The opacity system in an in-situ technique, but it suffers an interference from any water vapor that is in the form of condensed liquid particles. This situation emerges as wet scrubbers are introduced to control emissions of pollutant gases. (Author conclusions modified)

53675 **APTIC NO. 77845**

Nishida, Konosuke, Tsuneo Honda, and Kazuji Bota

NEW APPARATUS ON THE MEASUREMENT OF ODOR INTENSITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-55.3.)*

A new apparatus and procedure for the measurement of odor intensity were developed. The apparatus has a switchover system free from odor to fresh air flow which can be done in arbitrarily short intervals. The dilution system by odorless media can be operated either manually or automatically. A closed dilution system in the range of 0 to 1000 is possible which reduces extremely small error on dilution. The error on dilution is always within 20% at any ratio. (Author abstract modified)

53676 **APTIC NO. 77723**

Nwankwo, Jerry N., Hugh W. Salzberg, and Amos Turk

OXIDIMETRIC ANALYSIS OF ODORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.7.)*

The oxidation of odorous vapors at the anode of an electrochemical cell was investigated as a technique for the instrumental analysis of odors. Linear potential sweep cyclic voltammetry was used to characterize the oxidizability of several amines, sulfides, and their mixtures on platinum, gold, glassy-carbon, and graphite electrodes. The oxidizability of individual amines on a platinum electrode in acetronitrile containing the sodium salt of perchloric acid as the supporting electrolyte was tertiary, secondary, and primary (in descending order). Separate current peaks were not obtained for various amines at a sweep rate of 5.3 volts/min; rather, a composite peak was obtained. The oxidizability of sulfides using platinum electrode at the same sweep rate and acetonitrile solution with 0.1 M $NaClO_4$ was tertiary-butyl sulfide, normal-butyl sulfide, and allyl sulfide (in descending order). A clear separation of peaks was observed when amines and sulfides were mixed. The amine peak appeared at 0.95 volts and the sulfide peak at 1.72 volts using a platinum electrode in acetonitrile with 0.1 M $NaClO_4$ as the supporting electrolyte. Thus it was possible to characterize mixtures of amines and sulfides with the technique. Oxidation of sulfides and amines on gold, glassy-carbon, and graphite electrodes did not reveal any significant advantage over a platinum electrode. (Author abstract modified)

53677 **APTIC NO. 77808**

Oeseburg, F. and R. Roos

IMPROVEMENT OF THE BEARING SYSTEM OF THE STOBER AEROSOL SPECTROMETER. *Atmos. Environ., 9(9):859-860, Sept. 1975. 4 refs.*

Unwanted aerosol particles were generated in the bearing system of the Stober aerosol spectrometer. The equivalent atmospheric concentration of this aerosol was higher than the concentration of atmospheric aerosol reported in the literature. Leakage occurred in the bearing system, especially at high pressures at the clean air inlet and large subatmospheric pressures at the suction side. The spectrometer was improved by introducing sealing rings in the bearing system. (Author abstract)

53678 **APTIC NO. 77951**

Peters, Edward T. and Jeffrey W. Adams

THE MEASUREMENT AND CONTROL OF GAS TEMPERATURE IN A METHOD 5 SAMPLING TRAIN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975. Paper 75-19.3.)*

Changes in gas temperature along the length of a Method 5 sampling train due to variations in stack gas temperature, sampling rate, filter box temperature, and the method of controlling the probe heating element were investigated. Temperatures during each run were measured in the stack, under ambient conditions and at four internal and external positions along the sampling train at 1-minute intervals. Measurements were continued until the system reached a state of thermal equilibrium. Substantial differences between gas temperature and external temperature were observed during experiments in which typical stationary sources conditions were tested. The method of controlling the probe heater and the gas sampling rate also exerted major influences on gas temperature and temperature profiles along the sampling train. Thus, gas temperature cannot be predicted or controlled on the basis of externally measured temperatures. The use of an internal thermocouple, having its reference junction at the back of the probe, to proportionally control the probe heater element provided a predictable gas temperature and a flat thermal profile along the system. This procedure is recommended as a modification to Method 5. (Author abstract modified)

53679 **APTIC NO. 77655**

Pocock, Robert E., David F. Ross, and Edward L. McGandy

OXYGEN ANALYZERS FOR THE NEW PROPOSED EPA POLLUTION STACK MONITORING REGULATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p. 1975. 1 ref. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-60.4.)*

The OJ oxygen analyzer system for the new proposed Environmental Protection Agency pollution stack monitoring regulations is described. The proposed regulations require oxygen to be measured when nitrogen oxides and/or sulfur dioxide must be measured. The OJ system is a combination dry type sampling system and oxygen analyzer mounted in an enclosure and bolted directly to the boiler flue or process gas duct wall. It is comprised of three basic parts: the sensor, the sample distribution block, and the probe. The OJ system produces a continuous percent by volume measurement of the oxygen content. This analysis is on the wet basis since no moisture is removed during the sampling. Optical across duct, NOx and SO2 analyzers also measure on a wet basis. This type of O2 measurement is more compatible than any other basis for O2 measurement.

53680 **APTIC NO. 78221**

Poetschke, Herbert

MEASUREMENT UNITS AND ANALYZERS FOR THE CONSERVATION OF CLEAN AIR. *(Mess-und Untersuchungsgeraete zur Luftreinhaltung). Text in German. Wasser Luft Betrieb, 19(4):162-166, 1975.*

The air pollution monitoring network in Bavaria and new instruments for the measurement and detection of air pollutants are described. The monitoring network includes instruments for the measurement of carbon monoxide, sulfur dioxide, total nitrogen oxides, nitrogen dioxide and total hydrocarbons, as well as meteorological parameters. Central data processing is done in a CAMAC module computer center. An industrial dust monitor Massometer is suitable for the separate measurement of respirable and coarse fractions. A stationary and portable dust instrument adopting the beta irradiation principle has been developed by the Krohne company. A new dust sampler by Sartorius uses the throughput volume as a reference. Portable oxygen measuring instruments, and monitors for hydrogen sulfide, and nitrogen dioxide have been developed by Schmohl KG, Munich. New automatic monitoring and warning instrument has been developed by Draeger for combustible gases and vapors in the air. The concentration is displayed as a fraction of the lower ignition limit.

53681 **APTIC NO. 77725**

Porch, William M. and James E. Lovill

SATELLITE AND SURFACE OBSERVATIONS OF TEXAS DUST STORMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-36.4.)*

Fast-response surface measurements and satellite observations of Texas dust storms were made in March and April of 1974. Nephelometer measurements of dust showed a strong correlation with simultaneous wind measurements. The vertical gradient of the nephelometer signals, which is a measure of the aerosol flux, showed a very strong power law relationship to the horizontal wind velocity. Frequency response and spectral density comparisons of the wind and dust data proved to be valuable tools for understanding the physical properties of dust suspension by wind. The anlysis of satellite data demonstrated the applicability of spectral separation of dust and cloud phenomena. (Author conclusions modified)

53682 **APTIC NO. 78300**

Pruzinec, Jozef

DETERMINATION OF SO2 IN THE ATMOSPHERE USING RADIOACTIVE IODINE KRYPTONATE AS IMPREGNATION MEDIUM IN CHROMATOGRAPHIC PAPER. *(Stanovenie SO2 v ovzdusi pouzitim radioaktivneho kryptonatu jodu impregnovaneho v chromatografickom papieri). Text in Czech. Chem. Listy, 69(6):610-612, 1975. 7 refs.*

A method for the determination of atmospheric sulfur dioxide involving the use of radioactive kryptonate is described. A macrodiffusion technique is used to impregnate chromatographic paper with the radioactive iodine kryptonate. The method was successfully employed for SO2 measurements in the 300-700 ppm concentration range.

53683 **APTIC NO. 77679**

Rimberg, D. and V. Hampl

AEROSOL PENETRATION OF DUSTED FELT FILTER MEDIA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.2.)*

The fractional penetration of aerosol by number concentration through a commonly used felt filter was measured as a function of air velocity at ambient conditions. The felt is dusted with Arizona road dust so that the felt filter is conditioned similar to that to the reverse jet high energy pulse type baghouse dust collector. The test aerosol is monodisperse polystyrene latex 0.500 micron diameter, consisting of more than 90% single particles and electrostatically discharged. Air velocity through the filter ranged from 0.75 cm/sec-15 cm/sec. Aerosol penetrations are also reported as a function of final filter pressure. The penetration measurements range from 0.3-10% according to the final filter pressure and test velocity.

Velocities for maximum penetration are observed. Aerosol penetration through the filter cake on a clean cloth is excessively high compared to a filter seasoned with dust. (Author abstract modified)

53684 **APTIC NO. 77787**

Robinson, J. W., L. E. Vidaurreta, D. K. Wolcott, J. P. Goodbread, and E. Kiesel

A METAL SPECIFIC ATOMIC ABSORPTION DETECTOR FOR GAS CHROMATOGRAPHY - ITS USE IN THE DETERMINATION OF LEAD ALKYLS IN GASOLINE. *Spectrosc. Lett., 8(7):491-507, 1975. 8 refs.*

A new atomic absorption detector for gas chromatography was developed. The detector exhibits the excellent specificity of atomic absorption while retaining the great sensitivity of carbon atomizers, exhibiting a sensitivity 500 times greater than a similar flame detector. Molecular background interference is small. The system was used to characterize the lead alkyl contents of gasolines.

53685 **APTIC NO. 77698**

Sacco, Anthony M., Alan H. Rinsky, and James T. MacDonald

DEVELOPMENT OF A NOISE MUFFLER FOR CERTAIN HIGH VOLUME SAMPLERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-59.5.)*

A method for reducing the sound level emissions from the BGI Model IIA high volume sampler was developed and tested. Reductions in noise averaged nearly threefold over the spectrum of octave band frequencies 500-1600 Hz. The sound deadening was accomplished by completely lining the interior surfaces of hivols with 2 in. thick 10 lb/cu ft density foam rubber, and by covering the bottom of the hivol with a sheet of the same material. Initial field tests of more than 150 of the silenced hivols indicate general acceptance of the new design by residents of neighborhoods in whcih they were installed. (Author summary)

53686 **APTIC NO. 77656**

Salo, Albert E., Samuel Witz, and Robert D. MacPhee

DETERMINATION OF SOLVENT VAPOR CONCENTRATIONS BY TOTAL COMBUSTION ANALYSIS: A COMPARISON OF INFRARED WITH FLAME IONIZATION DETECTORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p. 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-33.2.)*

The determination of solvent vapor concentrations using total combustion analysis (TCA) is described and compared with flame ionization detectors. The TCA involves the measurement of stack flow volume, and the collection of samples in a stainless steel freezeout trap followed by an 8 liter stainless tank in tandem. An analysis of the organic carbon in trap and tank is made by conversion and measurement of carbon dioxide. The performances of the two systems were compared using synthetic mixtures of carbon monoxide, methane, CO2, and hexane, all in a special 5% oxygen carrier gas, and on identical field emission samples. The new systems operated well. The overall standard deviation was + or -3.4% on the collective synthetic samples. Advantages of TCA include: improved sensitivity, better stability, more reliable day to day operation, and a linearity over a wider dynamic range. (Author abstract modified)

53687 **APTIC NO. 78007**

Schmitt, Rainer

NEW INFRARED SYSTEM FOR MEASUREMENT OF CO2, CO, H2O FROM AIRCRAFT. *Atmos. Environ., 9(9):865-866, Sept. 1975. 2 refs.*

A new measuring device for carbon dioxide, carbon monoxide, and water vapor based on the infrared technique is described. It is specially built for use in aircraft studies. The CO2 measuring system consists of a 130 mm adsorption cell. By means of two lithium-fluorine lenses a thermal infrared light source is projected through the absorption cell on a thermoelectrically cooked mercury cadmium tellurium infrared detector. In front of the detector is an optical chopper with three narrow band-pass filters for water (2.6 micron), CO2 (4.2 micron), and CO (4.9 micron). Simultaneous measurements are possible for two components. A channel for 3.7 micron is used as a reference to compensate noise and drift of both the infrared emitter and the detector. The air to be analyzed passes through a dust filter and an airtight pump. (Author abstract modified)

53688 **APTIC NO. 78215**

Schuster, B. G.

THE USE OF TWO ANGLE ELASTIC AND RAMAN SCATTERING TO OBTAIN MOLECULAR DENSITY AND AEROSOL SCATTERING PROFILES. *Opt. Quantum Electron., 7(3):215-220, May 1975. 7 refs.*

A method which utilizes both the elastic and nitrogen induced Raman scattering from a series of lidar interrogations to obtain atmospheric molecular density profiles is described. The procedure is carried out in the backscatter mode at the zenith and one other slant path at some angle from the zenith. An auxiliary measurement of temperature and pressure at some point along the interrogation trajectory may be used to calibrate the lidar signatures and provide the normalization for the density profile and the derived temperature and pressure profiles. The elastically scattered signature which is most sensitive to the dust content of the atmosphere may be normalized to the molecular density profile to provide range and relative back scattering information relevant to the aerosol content of the atmosphere. (Author summary modified)

53689 **APTIC NO. 78368**

Shiroyama, H.

MEASUREMENT METHOD FOR BENZENE, TOLUENE, AND XYLENE IN THE ATMOSPHERE BY THE GAS CHROMATOGRAPHIC METHOD. *(Gasu kuromatogurafu ho ni yoru taikichu no benzen, toruen, kishiren, no sokutei ho ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(8):547-581, Aug. 1975. 1 ref.*

The chromatographic method for measuring benzene, toluene and xylene (three isomers) in the atmosphere was evaluated using the Varian model 2740-10 gas chromatograph. As a solvent, n-hexane was most suitable, and the detection limit was improved by increasing the purity of n-hexane. The calibration curves were prepared, the recovery rate was calculated (76.0-99.4%) and the correlation coefficient was obtained from regression curves (r equals O.97-0.99). Samples collected at a naphtha cracking plant, an aluminum smelting mill, a pharmaceutical plant, a carbon electrode manufacturing plant, a plywood manufacturing plant, a plastic bathtub manufacturing plant, and along a major highway were analyzed. All three substances were detected in all samples. However, the concentration of toluene was particularly high compared to the other two. Among xylene isomers, the concentration of p-xylene was always the lowest. The concentrations of m- and o-xylene varied from place to place. In the atmosphere along the highway, the benzene, toluene and xylene determined were 0.01-0.09 ppm. No benzene, toluene and xylene were detected in atmospheric samples used as controls.

53690 **APTIC NO. 77971**

Shofner, Frederick M., Gerhard Kreikebaum, and Harold W. Schmitt

IN SITU CONTINUOUS MEASUREMENT OF PARTICULATE MASS CONCENTRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-41.1.)*

An instrument capable of making in situ continuous measurements of particulate mass concentration, independent of particle size distribution for the particle size range of 0.05-10 micron diameter, is described. The instrument is based on the principle of laser light scattering and is essentially a backscattering device. The backscattered light is detected in a combination of angles in the backangle lobe. The incident light is a highly colliminated beam of monochromatic light whose wavelength is 0.9 micron. The critical electro-optical components are all contained at the end of a probe which may be inserted any distance into essentially any process gas stream. The sampling volume is completely optically defined and encompasses approximately 12 cu cm. This volume is external to the probe and is configured relative to the probe so that the probe does not disturb the sampled gas stream as it passes through the sampling volume. The sensitivity of the instrument of 0.005 grains/actual cu ft of process gas. Results of a series of simultaneous measurements with the device and with a standard isokinetic sampling train downstream of a precipitator serving a coal-fired power plant are presented.

53691

APTIC NO. 77952

Smith, Marvin L.

VELOCITY CALIBRATION OF EPA TYPE SOURCE SAMPLING PROBE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-19.4.)*

The necessity of velocity calibration for the Environmental Protection Agency type source sampling probe is discussed. The EPA methods for source sampling imply that total particulate and velocity measurements should be made simultaneously with a classic probe assembly capable of traversing for these parameters. Wind tunnel tests show the necessity for calibrating the velocity probe as an integral part of the sample probe assembly. Adjacent probe elements alter the air flow pattern in the vicinity of the sensing ports and influence the calibration. Accepting the manufacturer s calibration coefficient or failing to calibrate the S-type pitot-static probe in the same configuration as that used for testing can lead to substantial errors, as indicated by a test value for particulate emissions of 0.054 lb/million BTU using a calibration coefficient of 0.71 (determined by calibration) versus a test value of 0.065 lb/million BTU using the probe manufacturer s value of 0.85. (Author abstract modified)

53692

APTIC NO. 77842

Sperling, Roger B., Michael A. Peache, and William H. Vauhgan

TRACING EMISSIONS FROM COASTAL POWER PLANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-58.2.)*

A ground based moving platform was used to make measurements of emissions from selected power plants in the South Coast Air Basin of California during four days in Oct. 1974. A remote sensor and two point sampling instruments were installed in a van to monitor air quality, at the surface and above, downwind of the target sources. There is a simultaneous real time detection of overhead sulfur dioxide/nitrogen dioxide and ground- level, plume related concentrations. Calculations of mass flux from remote sensing data are presented. The relationship between instantaneous moving ground level concentrations is discussed. The moving laboratory provides a bridge between stack emissions and ambient air quality. Location of the plume path with the moving remote sensor provides a basis for relating episodes at fixed stations to a given source. (Author abstract modified)

53693

APTIC NO. 78101

Spurny, K. R. and W. Stober

ASBESTOS MEASUREMENTS IN AMBIENT AIR. *Clean Air, 9(2):38-41, May 1975. 20 refs.*

Four different types of filters were compared in order to determine their relative suitability for direct evaluation of the fiber deposits by light microscopy, transmission electron microscopy, and scanning electron microscopy. Samples of airborne solids were filtered. The measured fiber concentrations for the exposure chamber sample as well as samples in the ambient air were highest when measured on the Nuclepore filters and lowest when measured on silver membrane filters. Nuclepore filters with mean pore sizes of, equal to, or less than 0.2 micrometers (diameter) have an efficiency coefficient for asbestos fibers in ambient air of about 95-98%. Asbestos fiber samples by means of Nuclepore filters from urban and non-urban air were readily distinguishable from the background particles and from the filter surface, when transmission electron microscopy was used.

53694

APTIC NO. 77745

Stahlhofen, W., L. Armbruster, J. Gebhart, and E. Grein

PARTICLE SIZE OF AEROSOLS BY SINGLE PARTICLE ObSERVATION IN A SEDIMENTATION CELL. *Atmos. Environ., 9(9):851-857, Sept. 1975. 14 refs.*

Particle size analysis based on observation of the terminal velocity of individual particles in a sedimentation cell is investigated. The settling chamber is a 3 mm cylindrical channel in the center of a copper block. Particles are illuminated with parallel laser light and examined by an ultramicroscope technique. The counting method permits elimination of the influence of the Brownian motion through statistical analysis, and thus determination of the size distribution of particles in the size range where the Brownian motion can be neglected. Experiments are carried out with polystyrene latex spheres and a condensation aerosol of di-2-ethylhexyl-sebacate (DES) in the size range between 0.3 and 5 micron. If, for particles of uniform size, the arithmetic mean value of the settling times is used, the Browning motion has no influence on the size evaluation. For particles above approximately 1.5 microns, not only the median diameter, but the whole size distribution of the aerosol can be determined by the sedimentation method. The diameters derived from the settling velocity agree within a few percent with results obtained by electron microscopy or optical size spectrometry. To achieve this accuracy, about 100 single particles have to be counted for each size evaluation. A resolution power of better than 2 percent is obtained if more than 100 single measurements are evaluated. The value of the slip correction factor of polystyrene spheres is found to be 1.34 plus or minus 0.011. (Author abstract modified)

53695

APTIC NO. 78132

Stone, J. P., H. G. Eaton, and F. W. Williams

ATMOSPHERIC SAMPLING: DESCRIPTION OF A SMALL FLOW-CONTROL VALVE UNIT. *Rev. Sci. Instr., 46(9):1288-1289, Sept. 1975. 5 refs.*

A small flow control valve unit is described for use as a portable sampler. The midget valve package incorporates filters and a critical orifice which controls time integrated sampling of whole air for intervals exceeding 8 hr. The valve, in conjunction with a container, comprises a shirt pocket size sampler. (Author abstract modified)

53696

APTIC NO. 78386

Strojek, Jerzy W., Dennis Yates, and Theodore Kuwana

DERIVATIVE SPECTROPHOTOMETRY: APPLICATION TO TRACE SULFUR DIOXIDE ANALYSIS. *Anal. Chem., 47(7):1050-1054, June 1975. 14 refs.*

A laboratory rapid scanning spectrophotometer employing an oscillating mirror for wavelength scanning was modified to provide wavelength modulation for derivative spectrophotometry. The modulation results from the superimposition of a small sinusoidal waveform for the oscillating mirror. For the analysis of spectra requiring high wavelength resolution, an optical design was developed which allows increased resolution and higher light throughput while sacrificing the width of wavelength scan. The spectrophotometer is able to analyze concentrations of sulfur dioxide gas at the 20 ppm range at a signal to noise ratio of unity in a 10-meter cell. (Author abstract modified)

53697 APTIC NO. 77753

Sugimae, Akiyoshi

EMISSION SPECTROGRAPHIC DETERMINATION OF TRACE ELEMENTS IN AIRBORNE PARTICULATE MATTER COLLECTED ON GLASS FIBER FILTER. *Anal. Chim. Acta, 78(1):107-113, Aug. 1975. 15 refs.*

An emission spectrographic method is described to determine the concentration of beryllium, cadmium, chromium, copper, lead, manganese, nickel, tin, and vanadium in airborne particulate matter collected on a glass fiber filter. Sample disks punched out from the glass fiber filter are packed in a shallow cratered electrode. An internal standard solution containing indium and cobalt is added and the disks are decomposed with sulfuric acid-hydrofluoric acid. A calcium fluoride-graphite mixture is added as a spectroscopic buffer before d.c. arc excitation. The precision of the method is better than + or - 18%. (Author summary)

53698 APTIC NO. 78172

Sugimae, Akiyoshi

SENSITIVE EMISSION SPECTROMETRIC METHOD FOR THE ANALYSIS OF AIRBORNE PARTICULATE MATTER. *Anal. Chem., 47(11):1840-1843, Sept. 1975. 16 refs.*

A rapid and sensitive emission spectrometric method for the routine analysis of airborne particulate matter collected on the glass fiber filter is described. The method is a powder dc arc technique involving no chemical preenrichment procedures. Airborne particulate matter was analyzed for silver, barium, beryllium, bismuth, cadmium, cobalt, chromium, copper, iron, gallium, lanthanum, manganese, nickel, lead, tin, vanadium, yttrium, and zinc. The values obtained from the samples of airborne particulate matter collected at 10 m above the ground in an industrial and a commercial area of Osaka are tabulated.

53699 APTIC NO. 78050

Tucker, A. W., M. Birnbaum, and C. L. Fincher

ATMOSPHERIC NO2 DETERMINATION BY 442-NM LASER INDUCED FLUORESCENCE. *Appl. Opt., 14(6):1418-1422, June 1975. 7 refs.*

An atmospheric nitrogen dioxide monitor that employs laser induced fluorescence is described. A compact helium-cadmium laser is used for excitation at a wavelength of 442 nm. Nitrogen dioxide concentrations as low as 0.6 ppb (by volume) can be detected with an 80-second integration time. The high sensitivity is due to the development of a liquid solution filter that does not fluoresce upon absorption of scattered laser light and an improved optical arrangement. The response of the instrument with respect to the concentration of NO2 is strictly linear and highly reproducible over the range tested (10-1000 ppb). Measurements of ambient NO2 levels over both rainy and clear days reveal levels of ambient NO2 as low as 1 ppb during the rainy periods. (Author conclusions modified)

53700 APTIC NO. 78220

Waechter, G. and H. D. Wiemann

THE TGS GAS DETECTOR: PROPERTIES AND POSSIBLE APPLICATION FOR THE CONSERVATION OF CLEAN AIR. *(Der TGS-Gasdetektor: Eigenschaften und moegliche Anwendung bei der Luftreinhaltung). Text in German. Wasser Luft Betrieb, 19(4):166-170, 1975. 14 refs.*

The TGS gas detector developed in Japan for reducing and combustible gases, such as hydrogen, isobutane, ethane, methane, carbon monoxide, ammonia, sulfur dioxide, and alcohol, is described. The semiconductor type measuring element, enclosed in a wire mesh, is composed of a sintered body of tin oxide, zinc oxide and 4-valent iron oxide in which two platinum spirals are embedded. The measuring element, adsorbing the gas to be indicated, changes its electric conductivity. Desorption of the gases results in a return to the original conductivity. The detector, suitable for indication in a range of 0-3000 ppm, is available in three different sensitivity classes.

53701 APTIC NO. 78051

Walter, Howard, Jr. and Dennis Flanigan

DETECTION OF ATMOSPHERIC POLLUTANTS: A CORRELATION TECHNIQUE. *Appl. Opt., 14(6):1423-1428, June 1975. 9 refs.*

Experiments designed to develop suitable correlation functions for the atmospheric monitoring of specified pollutants by remote infrared sensing techniques are reported. The correlation function for a particular target pollutant is calculated by the simplex optimization method. This technique constrains the response of the gas detection system to less than some arbitrary constraint limit for background changes while optimizing system response to the target pollutant. Dimethylmethylphosphonate (DMMP), a relatively innocuous organophosphorus compound that possesses strong spectral similarities to the organophosphorus pesticides, was selected as an illustrative target. The response to the target pollutant was two to three times greater than any background induced change over a period of 2 wk. The technique is applicable to a wide range of spectral analytical problems and may apply to process control as well as remote sensing techniques. (Author abstract modified)

53702 APTIC NO. 77954

Wilson, David

MEASUREMENT OF HYDROCARBONS FROM COATING OPERATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, Boston, Mass., June 15-20, 1975, Paper 75-19.6.)*

Organic solvent emissions from coating operations were successfully analyzed using a flame ionization detection system. Exhaust duct emissions were sampled through a 1/8 in. teflon tube by a Meloy Model SH2O2 sulfur and hydrocarbon gas analyzer. The resulting electrometer output was graphically recorded in real time. Hydrocarbon concentrations between 0.1 and 5000 ppm (by volume) were recorded. An integration of the solvent concentrations was obtained from the strip chart recording, and this value (in ppm) was converted to mg/l of air. The exhaust air volume was determined with a standard pitot tube and multiplied by the hydrocarbon emission factor to determine the lb/hr of organic solvent emissions. Coating operations sampled included paint spraying (with dry filter and water wash control devices), flow coating, and conveyor bake ovens. (Author abstract modified)

53703 APTIC NO. 77891

Wolfe, Court L. and Paul Giever

DESIGN, FABRICATION AND EVALUATION OF A FLUORESCENCE SULFUR DIOXIDE MONITOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 26 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-65.1.)*

A continuous fluorescent sulfur dioxide monitor is described, in which the sample is drawn into a cell and irradiated by a monochromatic ultraviolet (UV) source. Sulfur dioxide (SO2) molecules present in the sample stream show a specific response to the short UV radiation (2138 angstrom) and fluoresce at a longer wavelength (2400 to 4200 angstrom). The level of this fluorescence is directly related to the partial pressure of sulfur dioxide in the sample stream. Field testing of the instrument has shown it to be rugged, dependable and accurate. The fluorescent signal is continuously corrected for any variation in the intensity of the irradiating source. Further corrections are made for detector dark current and stray light. The endton photomultiplier detector operates in the photon counting mode, resulting in a wider linear detecting range and good baseline stability. The photon pulses are processed and displayed by a random logic digital system. The monitor was calibrated in the laboratory against the barium-thorin titration procedure for mixtures of SO2 and air. It was then evaluated in the field at a fossil fueled steam generating facility operating under fairly constant load. Simultaneous samples comparing the barium-thorin titration procedure with the SO2 monitor scale agreed within 1%. (Author abstract modified)

53704 APTIC NO. 77944

Zolner, William J. and Glenn W. Dillon

MONITORING OF NO-NO2 IN AN URBAN ENVIRONMENT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-56.2.)*

The pollution level (nitric oxide-nitrogen dioxide) was monitored in Boston, Mass. to ascertain the typical levels of NO and NO2 to which an urban worker could be exposed. The exposure that an urban worker would encounter in traveling to work, working an 8-hour day in the city, and in traveling home to the suburbs was simulated. Particular attention was given to transient exposure levels of NO and NO2. A new chemiluminescent instrument for the monitoring of NO-NO2-nitrogen oxides was used. Rapid transients of NO within urban environments result in the typical chemiluminescent sample-and-hold type instrument giving erroneous results for NO2. The new chemiluminescent instrument used has two reaction chambers, one for NO, the other for NOx, coupled to one photomultiplier tube which is multiplexed at a rate above the transient levels of NO in the atmosphere, allowing accurate measurements of urban levels of NO2. (Author abstract modified)

53705 APTIC NO. 78117

FREE SILICA SIO2. *Am. Ind. Hyg. Assoc. J., 36(8):642-645, Aug. 1975. 19 refs.*

Recommended atmospheric concentrations are given for respirable dust, total dust, and free silica. Three measurement methods; X-ray diffraction, infrared spectroscopy, and colorimetry; are described. The X-ray diffraction method determines the mass of each free silica species by measuring the intensities of the diffraction peaks, which form characteristic diffraction patterns for each crystalline substance. The infrared spectroscopy method determines the concentration of a given compound from the intensity of its characteristic absorption band in the infrared spectrum. The colorimetric method involves dissolving particulate silica in acid and determining it colorimetrically as yellow silicomolybdate or as molybdenum blue after reduction with 1-amino-2- naphthol-4-sulfonic acid. Samples for all three measurement methods are collected on membrane filters preceded by a cyclone to remove non-respirable dust. Possible interferences, special reagents and equipment, sensitivity, accuracy, and comments are included for each measurement method.

1974

53706 APTIC NO. 77905

Goldstein, Harold W. and M. H. Bortner

THE REMOTE MEASUREMENT OF TRACE ATMOSPHERIC SPECIES BY CORRELATION INTERFEROMETRY. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 117-123. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

A correlation interferometer was developed for the measurement of carbon monoxide and methane at 2.35 micron in the troposphere and in the stratosphere. This instrument has been used in laboratory tests, solar-looking outdoor tests, and downward-looking airplaine-based tests over both polluted and unpolluted regions of North America. The results of these various tests are discussed and compared with simultaneous measurements made by other techniques. Since the results obtained for carbon monoxide and methane were good, a study was undertaken to investigate the feasibility of measuring other stratospheric trace gases using the correlation-interferometric technique. Results of this study, including necessary characteristics for the instruments to be used, are tabulated and discussed. (Author abstract modified)

53707 APTIC NO. 77800

Hayakawa, M., T. Aoyama, and T. Sakai

DETERMINATION OF MERCAPTANS IN AIR BY THE P-AMINO DIMETHYLANILINE METHOD. *(P-Amino dimethylaniline ho ni yoru taiki chu merukaptan no sokutei). Text in Japanese. Nagoya-shi Kogai Kenkyusho Ho (Rep. Environ. Pollut. Res. Inst. City Nagoya), 3:19-21, 1974. 3 refs.*

The colorimetric determination method using p-amino dimethylaniline was applied to the measurement of mercaptan concentration in an atmospheric sample. The preparation methods for a standard solution and calibration curve are described. The variations in collecting efficiency with the type of intake nozzle and flow velocity of sample gas were investigated. The collecting efficiency decreased slightly with the increase in flow velocity. Effects of interfering substances were tested and tolerable concentrations were found to be 80 microliters for dimethyl sulfide, 71 microliters for hydrogen sulfide and 19 microliters for carbon disulfide. The mercaptan concentrations measured (ppb) in the vicinity of a kraft pulp mill were 15.5-234 at a waste water outlet, 0-16.0 at 20 m, 3.5-22 at 100 m, 3.5 at 300 m, 0-7.2 at 1 km, and 0-1.1 at 2 km. The reliability of the method tested by simultaneously placing four samplers in a draft with methyl mercaptan sample was + or - 14%. Only the total amount of mercaptans can be determined by this method, and it is suitable only for the measurement of average concentration over a long period of time due to its low sensitivity. The use of a high concentration solution of mercury compound is a hazard of this method.

53708 APTIC NO. 75935

Hermann, T. S.

DEVELOPMENT OF SAMPLING PROCEDURES FOR POLYCYCLIC ORGANIC MATTER AND POLYCHLORINATED BIPHENYLS (FINAL REPORT). *Langston Labs., Inc., Leawood, Kans., Environmental Protection Agency Contract 68-02-1255, Proj. 73-1179, Program Element 1AA010, ROAP 26AAN, Rept. EPA-650/2-75-007, 106p., Aug. 1974. 49 refs.*

NTIS: PB 243362/AS

The Environmental Protection Agency Method 5 train, a train with a cartridge filter, and a train developed by Hangebrauck, Von Lehmden, and Meeker were evaluated for the collection of polychlorinated biphenyls, benzo(3-4)pyrene, and other polycyclic organic compounds. Arochlor 1242, pyrene, anthracene, BaP, benzo(a)anthracene, and coronene were selected to determine collection efficiencies. A modified train based on all three of the above designs was developed and found to be efficient for the simultaneous collection of BaP, PCB s, and polycyclic compounds during field tests at various stationary sources. (Author abstract modified)

53709 APTIC NO. 77963

Hodgeson, J. A.

AIR-POLLUTION CONTROL. *vIn: Yearbook of Science and Technology. McGraw-Hill Encyclopedia of Science and Technology Staff (eds.), New York, McGraw-Hill Co., 1974, p. 96-99.*

Monitoring techniques are broadly divided into contact- and remote-sensing. The polluted air sample is brought into contact with the sensing device in contact techniques, which include chemiluminescent, fluorescent, and X-ray fluorescence techniques. Chemiluminescent techniques involve reaction between a reagent and the pollutant of interest, which produces a characteristic emission of light. The light is viewed by a photomultiplier tube. Ozone, nitric oxide, and nitrogen dioxide are measured by this method. A fluorescent detector uses a high intensity light source to irradiate a flowing airstream and induce fluorescence from the pollutant of interest. A photomultiplier tube monitors the fluorescent emission. Fluorescence detectors have been developed for sulfur dioxide and NO2. The X-ray technique involves irradiating the air filter with a beam of high energy X-rays. The elements within the sample are excited and emit fluorescent X-ray photons. The energy of the photon is characteristic of the element, and the intensity or rate of photon emission is proportional to elemental abundance. Remote techniques are used to measure average pollutant concentrations over an extended path in air or to measure the pollutant at a given location with a remotely located sensor, and include infrared and lidar techniques. Infrared absorption techniques for remote sensing employ either the sun or an artificial infrared source, a long optical path through the atmosphere, and a detector. Virtually all molecules possess absorption bands in the infrared region. Lidar devices measure atmospheric aerosols. The application of lidar systems is analogous to detecting clouds and rain by radar.

53710 APTIC NO. 78255

Kitase, M., E. Ito, and T. Miyamoto

A STUDY OF EMISSION SPECTROGRAPHIC DETERMINATION OF HEAVY METALS IN THE AIR: THE USE OF THE DIRECT READING METHOD. *(Hakko bunko bunsekiho ni yoru taiki chu jukinzoku no sokutei.---Koden sokko ho no riyo ni tsuite). Text in Japanese. Nagoya-shi Kogai Kenkyusho Ho (Rep. Environ. Pollut. Res. Inst. City Nagoya), no. 3:11-13, 1974. 2 refs.*

For the measurement of micro-amounts of heavy metals in the air, the emission spectrographic determination by the direct reading method was investigated. The emission conditions and selection of buffer agent (graphite and alkaline compound) were evaluated. The effect of the buffer agent was investigated by varying the ratio of graphite and sodium chloride. In the case of iron, the spectral intensity began to increase at 25 sec when the graphite: NaCl ratio was 1:10, and the increasing trend diminished linearly with the increase in NaCl ratio. A similar tendency occurred by chromium, nickel and manganese. In the case of copper, zinc and lead, the effect of the buffer agent was approximately linear. The calibration curve was prepared under the following conditions: discharge current 6.1 ampere, preliminary discharge 3 sec, integral time 25 sec, analysis slit 3 mm, graphite to NaCl ratio 7.5:1. The coefficients of variation in the case of using a 33 ppm sample were 4.1% for Zn, 6.4% for vanadium, 3.1% for Pb, 6.5% for Fe, 4.2% for Ni, 6.8% for Cu, 6.6% for aluminum, and 7.6% for Mn.

53711 APTIC NO. 78277

Konno, Shinya and Toshiichi Okita

DETERMINATION OF PEROXYACETYL NITRATE (PAN) PRODUCED IN THE ATMOSPHERE OR IN A PHOTOCHEMICAL REACTION CHAMBER (I). *(Taikichu matawa kokagaku hanno ni yoru chenba chu de seisei sareta PAN no sokuteiho (I)). Text in Japanese. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 23(1):50, 1974.*

The determination method for peroxyacetyl nitrate by gas chrmomatography with an electron capture detector was studied. Standard PAN was prepared in a 1300 ml pyrex chamber filled with 0.31% ethyl nitrite and balanced oxygen, and the chamber was irradiated with ultraviolet light with thhe peak intensity at 350 nm for 8 min. The generated PAN was transferred into a cold trap followed by a GC column separation at room temperature for the purification of PAN. The purified PAN from the column effluent was then trapped into another cold trap, and was then eluted into a vacuum bottle using nitrogen gas at room temperature as standard PAN. Part of the purified PAN in the bottle was absorbed into a 0.5N sodium hydroxide solution and the alkaline hydrolysis product was determined by the Saltzman method in order to obtain the purified PAN concentration in the bottle. Since PAN was unstable, the determination of the purified PAN concentration in the bottle was made while the gas chromatographic calibration curve for PAN was being prepared, and n-propyl nitrate was used as the internal standard to calibrate the GC response when the sample gases were analyzed for PAN. A linear calibration curve could be obtained by taking the gas chromatographic peak height of PAN when conditions were adjusted so that the same retention time was obtained every time. The detection limit of PAN using the standard gas was 4 times 10 to the -13 power mole. The atmospheric PAN determination made at Urawa showed as high as 0.03 ppm PAN, and the 5-hr irradiation by artificial ultraviolet light produced as high as 37 ppb PAN.

53712 APTIC NO. 78246

Milczarska, Anna

DETERMINATION OF CHLORINE IN THE AIR BY KETTNER S METHOD. *(Oznaczanie chloru w powietrzu wg metody kettnera). Text in Polish. Med. Pracy (Lodz), 25(1):53-58, Jan. 1974. 18 refs.*

The colorimetric method of Kettner for determination of chlorine in the air has been evaluated. The method is based on the measurement of the discoloration of methyl orange solution at a wavelength of 510 nm. The following factors were investigated: the effect of environment on determination of quantity of chlorine, effect of presence of other oxygenation compounds, effect of temperature and a comparison with the method recommended by Polish Specification 65/Z-04037 which is based on the use of o-tolidine. Solutions required for the analysis are very stable and results of measurements follow the Beer law (linear calibration curve) in the range of concentrations of 1 to 15 micrograms of chlorine per sample. Standard deviation, computed on the basis of 7 series of samples was 0.043. The results of the test are not affected by temperature variation of the air from 10 to 30 C. The accuracy is not impaired by the presence of ozone (up to several micrograms), sulfur dioxide (10-300 micrograms), nitrogen oxides (up to 300 micrograms), and iodine (up to 20 micrograms). The accuracy is affected by bromium, whose effect is similar to that of chlorine. A 100% absorption of chlorine has been obtained for air flow rates of about 1 l/min. In a majority of cases the concentrations of chlorine recovered were 20-30% higher than those obtained with the o-tolidine method.

53713 APTIC NO. 77966

Nelson, J. W., J. W. Winchester, and R. Akselsson

AEROSOL COMPOSITION STUDIES USING ACCELERATOR PROTON BOMBARDMENT. *Florida State Univ., Tallahassee, Dept. of Physics and Dept. of Oceanography, Appl. Small Accel. Conf., 3rd, Denton, Tex., 1974, p. 1-9. 4 refs. (Oct.)*

The proton beam of the Florida State University Tandem Van de Graaf Accelerator is being used to make quantitative determinations of the composition of particulate matter found in the atmosphere. Proton scattering using 16 MeV incident particle energy is employed to resolve the light elements (up to chlorine), while aluminum and heavier elements are observed via proton induced X-ray emission analysis. The combination provides a means of quantitative determination for all elements. Well focused accelerator beams permit measurement on samples small in size and of thickness up to approximately 1 mg/sq cm. Specialized air sampling equipment has been built to take advantage of the small size of samples required for proton induced analyses. Analyses may be completed in times of several minutes with the aid of automated sample changing under control of a mini-computer. The multielement character, ease of automation and short time needed for analysis make these techniques attractive from the standpoint of analysis cost per sample for projects requiring a large number of analyses. (Author abstract modified)

53714 APTIC NO. 77977

Wang, Charles C. and L. I. Davis, Jr.

MEASUREMENT OF HYDROXYL CONCENTRATIONS IN AIR USING A TUNABLE UV LASER BEAM. *Phys. Rev. Lett., 32(7):349-352, Feb. 18, 1974. 9 refs.*

Hydroxyl concentrations in air were measured by detecting the resonance fluorescence excited by radiation from a tunable dye laser near 2825.8 angstroms. The system used to obtain the measurements is described. The OH concentrations deduced from these measurements ranged on one particular day from a high of 1.5 times 10 to the 8th power OH/cu cm in the early afternoon to a level below 5 times 10 to the 6th power OH/cu cm at night. (Author abstract modified)

53715 APTIC NO. 77976

Wilber, K. R., F. M. Shofner, and M. J. Margetts

MEASUREMENT AND CHARACTERIZATION OF COOLING TOWER DRIFT. *Preprint, American Society of Mechanical Engineers, New York, Heat Transfer Div., 12p., 1974. 8 refs. (Presented at the American Society of Mechanical Engineers Winter Annual Meeting, New York, Nov. 17-22, 1974, Paper 74WA/HT-60.)*

Techniques and principles for drift particle measurements using particulate instrumentation by laser light scattering, sensitive paper, and isokinetic sampling devices in and near wet cooling towers are reviewed. The devices can be used with accuracies of + or - 15% for determination of the particle density distributions, from which other pertinent drift information are derived. On-line data acquisition procedures are treated. Principles, operating procedures and accuracies for the airborne particle sampler are reviewed. Application of the system to measurement of both cooling tower effluent and ambient salt levels are described. (Author abstract modified)

53716 APTIC NO. 77975

Rijks Instituut voor de Volksgezondheid

THE DUTCH NATIONAL MONITORING SYSTEM FOR AIR POLLUTION. *Rept. U 35/74 NMC Eg/tf 1974-04-26, 12p., 1974.*

Considerations affecting air pollution monitoring in general are briefly discussed. The major objectives of air pollution monitoring systems are to obtain information concerning geographical distribution of pollution, trend evaluation, origin of pollution, compliance with air quality standards, assessment of control, and warning systems. Several basic techniques must be used to meet these objectives, including immission monitoring at fixed ground level stations, mobile immission monitoring units, and emission monitoring. The Dutch National Monitoring system for Air Pollution is described. The emission measurements are carried out using a moving laboratory equipped with a correlation spectrometer. The immission monitoring system consists of 220 automated monitoring stations for the measurement of sulfur dioxide. The monitoring stations also process wind velocity and wind direction data. A data reductor computer calculates minute values, moving means, hourly values, and daily values from the signals received from the stations. The National Measuring Centre controls all regional data reductors, including synchronizing the timing of the total system, zero-check, calibration and processing, and storage and presentation of information obtained from the regional data reductors. On-line data evaluation includes displaying the hourly data both numerically and on a map and giving warning indications of unfavorable conditions. Off-line data evaluation includes contour mapping which can be used in conjunction with air quality standards and air quality simulation and empirical models.

53717 APTIC NO. 78282

AIR POLLUTION MEASURING DEVICES. *(Urzadzenia do pomiaru zanieczyszczen powietrza). Text in Polish. Ochrona Pracy (Warsaw), no. 6:20-23, 1974.*

Various air pollution measuring devices are analyzed. The most commonly used device for measuring toxic concentrations of chemical compounds in the air are hand pumps with graded glass tubes containing chemical compounds which change color upon contact with toxic substances in the atmosphere. Another method of detection and measurement is the study of the thermal conductivity of gases, based on the principle change in resistivity with temperature. To measure carbon monoxide and hydrogen content in exhausts, the method of thermal gradation is used. The measurement chambers of the device are large metal blocks with 4 openings of equal size. A platinum wire is stretched along the axis of each opening. Two openings lead to the measurement chamber, where the gas is introduced from the main pipe through capillaries. Gas with a constant thermal conductivity passes through the other 2 openings. This device (with the addition of an anti-explosive device) can be used to measure explosive or flammable mixtures with air containing over 21% oxygen. These devices, which can be either stationary or mobile, are manufactured by the Siemens and Oxymat companies.

1973

53718 APTIC NO. 78237

Bianchi, A. and C. Sergi

DETERMINATION OF CARBON MONOXIDE IN WORK ENVIRONMENTS BY MEANS OF GAS CHROMATOGRAPHY. *(Determinazione per via gascromatografica di tracce di ossido di carbonio negli ambienti di lavoro). Text in Italian. Ann. Ist. Super. Sanita (Rome), 9(1):540-543, 1973. 3 refs.*

Techniques for the sampling and gas chromatographic determination of carbon monoxide in the air of work environments are described. A 5A molecular sieve column (2 m long by 4 mm wide) is used for the analysis. The column temperature is 80 C. The analysis requires about 25 min. The quantitative analysis is made with the aid of calibration curve obtained by means of an exponential diluent. Carbon monoxide concentrations between 0.5 and 2 ppm can be detected with the method.

53719 APTIC NO. 77716

Doerr, Wolfgang and Wolf Lanzer

INFORMATIONAL CAPACITY OF WASTE-GAS MEASUREMENTS FOR DESCRIBING THE SLAG CONDITION IN THE LD PROCESS. *(Aussagefaehigkeit der Abgasmessung zur Kennzeichnung des Schlackenzustandes beim LD-Verfahren). Text in German. Stahl Eisen (Duesseldorf), 93(19):876-884, Sept. 1973. 7 refs.*

Efforts to control the LD converter process as a function of the slag condition to be determined from flue gas analyses by means of an on-line computer are described. The carbon monoxide and carbon dioxide contents of the flue gas were determined by IR gas analyzers, and the oxygen content was determined by thermomagnetic method. The amount of oxygen bound in the slag is found as the difference between the total oxygen input and the oxygen content of the flue gas. The measuring technique proved to be the main source of error, even in the case of mass spectrometric analysis, which indicates that flue gas analysis is at present unsuitable for the control of the blow process.

53720 APTIC NO. 77636

Rodnikova, I. V., G. K. Alekseeva, S. K. Gabdulina, L. M. Lastovka, and G. I. Pakhotin

DETERMINATION OF SMALL AMOUNTS OF NITROUS OXIDE WITH AN ENERGY FOCUSING PRISMATIC

MASS SPECTROMETER. (Opredelenie nebol shikh kolichestv zakisi azota pri pomoshchi prizmennogo mass-spektrometra s fokusirovkoy po energii) Text in Russian. Tr. Inst. Org. Katal. Elektrokhim. Akad. Nauk Kaz. SSR, no. 5:208-209, 1973. 1 ref.

A prismatic spectrometer with a resolution power of 4000 was used to determine 10 to the minus 4 power percent nitrous oxide in the presence of carbon dioxide. Calibration was carried out by using argon. At a N2O concentration of 0.13%, the peak height ratio of argon 38 to N2O was 1.0. The pressure in the reservoir of the mass spectrometer MKh-1302 was 5 by 10 to the minus 2 torr and the relative error of the analysis was 5-10%.

53721 **APTIC NO. 78232**

Spiga, G. and P. Cherchi

CONSIDERATIONS ON THE USE OF GRAVIMETRIC TECHNIQUES IN THE EVALUATION OF THE PNEUMOCONIOGEN HAZARD, AND COMPARISON BETWEEN THE RESULTS OBTAINABLE WITH STATIC-TYPE AND PERSONAL DRAWING EQUIPMENT. *(Considerazioni sulla utilizzazione di tecniche gravimetriche nella valutazione del rischio pneumoconiogeno e confronto tra risultati ottenibili con apparecchi di prelievo di tipo statico e personale). Text in Italian. Ann. Ist. Super. Sanita (Rome), 9(1):477-485, 1973.*

Gravimetric techniques for evaluating pneumoconiosis risk due to dust are discussed, and the performance of stationary samplers versus that of personal sampling equipment is compared. Dust measurements are frequently lower when taken with stationary samplers as compared with results obtained from equipment capable of sampling dust in the immediate vicinity of each worker. Stationary measurements of dust at a textile factory averaged 30% lower than dust measurements made with personal samplers.

1970

53722 **APTIC NO. 77857**

Oliveira-Meditsch, Jorge and Clarisse Maria Sartori-Pietnicki

ABSORPTIONOMETRIC DETERMINATION OF AS+++ WITH METHYLENE BLUE TETRAIODIDE. *(Determinacao absorciometrica de As+3 com iodeto de tetraiodo de azul de metileno). Text in Portuguese. Rev. Quim. Ind. (Buenos Aires), 39(459):11-12, July 1970. 3 refs.*

Arsenic ions with a plus 3 valence may be detected in an aqueous solution by adding the tetraiodide of methylene blue and making an absorptionometric determination. The extinction peak for an arsenic concentration of 6 ppm, submitted to spectrometry after centrifugation of the undissolved reagent, occurs at 660 millimicron when the temperature range is 20-25 C. Reaction time is 30 min. A buffer solution, consisting of borax and boric acid in saturation at pH 6.2, is used to inhibit the reverse reaction. The presence of alkaline compounds and of 5 ppm of the sulfite, thiosulfate, mercurous, mercuric or (especially) stannous ion causes interference. The presence of 10% potassium nitrate causes 4% error, and 5% sodium nitrate a 19% error in determinations. Methylene blue deteriorates rapidly on exposure to direct sunlight.

AIR QUALITY MEASUREMENTS

1975

53723 **APTIC NO. 78244**

Arai, Ushimatsu, Minoru Osa, Hidezo Ogaki, Yasuo Hashimoto, Shoji Fukuda, Ikuko Ashida, and Shigeru Suzuki

ENVIRONMENTAL SURVEY AT THE CEMENT AND LIME INDUSTRIAL AREA. *(Semento, sekkai kogyo chiiki no kankyo chosa ni tsuite). Text in Japanese. Tochigi-ken Kogai Kenkyusho Nenpo (Annu. Rep. Tochigi Prefect. Res. Inst. Environ. Pollut., no. 1:94-103, Jan. 1975.*

Relationships between dust (precipitated, airborne, emitted) and toxic metals (cadmium, chromium, lead), were studied in the town of Kuzuu, Tochigi Prefecture, Japan, from 1971 to 1973. Cement and lime comprise of the bulk of the industries located in the area. In 1973, at 12 monitoring locations in the town, average annual concentrations of precipitated dust ranged from 14.79-50.53 ton/sq m/mo. Amounts of metals contained in the dust ranged from 4.1-16.6 ppm for Cd; 24.6-100 ppm for Cr; 136-741 ppm for Pb. Airborne dust concentrations were measured during 1971-1972 at 8 locations. Average dust concentrations ranged from 0.13-1.01 mg/cu m. Concentrations of toxic metals included in airborne dust (microgram/cu m) ranged from 0.002-0.013 for Cd; 0.015-0.260 for Cr; 0.075-0.503 for Pb. From 1971 to 1973, 14 facilities from 9 factories emitted 800 kg of soot per hr, before dust collectors were installed. Cement factories emitted highest concentrations of toxic metals in general, especially Cd (351 ppm) and Pb (7100 ppm). Dolomite factories emitted high concentrations of Cr (128 ppm). A slight decrease has been found in dust pollution since 1971.

53724 **APTIC NO. 77693**

Cleveland, William S., Beat Kleiner, Jean E. McRae, Jack L. Warner, and Ralph E. Pasceri

THE ANALYSIS OF GROUND-LEVEL OZONE DATA FROM NEW JERSEY, NEW YORK, CONNECTICUT, AND MASSACHUSETTS: DATA QUALITY ASSESSMENT AND TEMPORAL AND GEOGRAPHICAL PROPERTIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1975. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-51.6.)*

Hourly, ground level ozone measurements from 41 sites in eastern New York, northern New Jersey, Connecticut and Massachusetts from May 1, 1974 to Sept. 30, 1974 are analyzed. Various techniques for assessing data quality and uniform calibration show the data are of high reliability for yielding information on the O3 problem in the region. Nighttime concentrations, relative to those during the day, are highest in Massachusetts. The ratio of the upper quartile of hourly average O3 concentrations at 1500 hr EST to the upper quartile at 0100 hr EST decreases with increasing distance from New York City, which is the center of the tri-state urban complex (northern New Jersey, southwestern Connecticut, and New York City). The site distributions of daily maximum concentrations are highest in the Stamford-Greenwich region of Connecticut and next highest in a region to the east and northeast of Stamford-Greenwich. (Author abstract)

53725 **APTIC NO. 78049**

Elterman, Louis

STRATOSPHERIC AEROSOL PARAMETERS FOR THE FUEGO VOLCANIC INCURSION. *Appl. Opt., 14(6):1262-1263, June 1975. 5 refs.*

Searchlight probing results of volcanic dust over New Mexico resulting from the eruption of the Fuego volcano located in the Guatemala Highlands are reported. A profile for the aerosol attentuation coefficient versus altitude is presented. Data reduction methods rule out any smoothing of field data at stratospheric altitudes between 11.7 and 26.3 km. A turbidity chart for the same profile is also illustrated. During one night over several hours of measurement, the major layer retained its altitude of maximum turbidity (about 16 km) remarkably well. The other layers were less stable. On the following night, the major layer was found at a somewhat lower altitude (approximately 15 km) but remained similar in appearance. A stratospheric dust increase of about 50% was observed compared with recent searchlight probing.

53726 **APTIC NO. 77654**

Gaddo, Pier Paolo, Franco Corazzari, and Luigi Giacomelli

AIR QUALITY MEASUREMENTS IN TURIN, 1971-1974. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p. 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-54.7.)*

The fundamental aspects of air pollution in Turin are examined in relation to its urban structure, anemologic situation, and main emission sources. The highest pollution levels occur in winter in concurrence with unfavorable weather conditions and the full activity of all the emission sources (particularly the heating plants). Critical values are found for sulfur dioxide and particulates, which are responsible for pollution conditions extended in space and time. Pollution from carbon monoxide is limited to restricted areas and is ascribable to critical traffic situations, but it remains at acceptable levels. Pollution from nitrogen oxides and hydrocarbons is evaluated as a function of the transformations that these pollutants undergo in the atmosphere. Twenty to 30% of this pollution comes from vehicular traffic. (Author abstract modified)

53727 **APTIC NO. 75930**

Gay, Bruce W., Jr. and Richard C. Noonan

AMBIENT AIR MEASUREMENTS OF VINYL CHLORIDE IN THE NIAGARA FALLS AREA. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., Program Element 1AA00A, ROAP 21AKC, Rept. EPA-650/4-75-020, 18p., May 1975. 9 refs.*

NTIS: PB 243695/AS

A 6-day survey of ambient vinyl chloride levels in the Niagara Falls area was conducted. Samples were obtained in a residential area adjacent to chemical plants where vinyl chloride emissions were suspected, in areas around the plants, and in other areas of Niagara Falls. The highest concentration of vinyl chloride measured was 40 ppb for a 5-hour integrated sample taken at a residential area two blocks east of a vinyl chloride polymerization plant. Grab samples taken downwind of chemical plants exhibited a high of 28 ppb. Samples taken from downtown Niagara Falls and upwind north of the chemical plants contained no detectable vinyl chloride. The areas surrounding the chemical plants were also affected by emissions of chlorine and other halogenated compounds as evidenced by deterioration of metal surfaces, particularly aluminum windows and doors. (Author abstract modified)

53728 **APTIC NO. 78085**

Grob, Robert L. and C. Michael Kelly

AMBIENT AIR POLLUTANT ANALYSES-INTEGRAL PART OF AN ENVIRONMENTAL IMPACT STUDY. *Environ. Letters, 8(3):235-258, 1975. 9 refs.*

Data on the major ambient air pollutants measured during an environmental impact study for roadway construction are presented. The pollutants include carbon monoxide, nitrogen oxides, photochemical oxidants, suspended particulates, and total hydrocarbons. Lead analysis and a justification for the lack of sulfur oxides data are discussed. Levels of oxidants, particulates, and NOx are of concern. The yearly average value for NOx is 0.0555 ppm, which is above the primary air quality standard. Oxidant concentrations average approximately 50% of the primary air quality standard limit, and particulate levels occasionally exceed the standard. Levels of CO and total hydrocarbons are well below the limits set by the Environmental Protection Agency.

53729 **APTIC NO. 78199**

Hirono, T., K. Akino, T. Ohira, M. Arashiya, and S. Matsushita

ON THE BENZOPYRENE POLLUTION ON TOKYO. *(Tokyoto no benzopiren to osen ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:1-6, 1975. 2 refs.*

Polynuclear aromatic hydrocarbon concentrations at 11 locations in Tokyo were measured in 1973. Dusts in the air were sampled with a high-volume sampler. Filters containing dusts were placed in the flask of a vacuum sublimation apparatus and heated at 300 C for 30 min at 0.01-0.001 mm Hg. The sublimated polynuclear aromatic hydrocarbons were dissolved in benzene and separated on one-dimensional, two-layer TLC of alumina G and cellulose acetate. The spots were cut and each compound was dissolved in DMSO. The aromatic hydrocarbons were analyzed by fluorescence spectrophotometry. Results showed that at the Hibiya intersection, the benzo(a)pyrene concentration was 2 microgram/ 1000 cu m air or 2 microgram/g dust and at Asakura Tunnel, the concentration was 10 microgram/1000 cu m air or 5 microgram/g dust. Approximately 95% of the polynuclear aromatic hydrocarbons were found in dusts smaller than 8 micron. Higher benzo(a)pyrene concentrations were observed in winter and the concentration increased with increasing carbon monoxide concentration.

53730 **APTIC NO. 78038**

Kertesz-Saringer, M. and Z. Morlin

ON THE OCCURRENCE OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE URBAN AREA OF BUDAPEST. *Atmos. Environ., 9(9):831-834, Sept. 1975. 7 refs.*

Samples of air from the urban area of Budapest were analyzed for polycyclic aromatic hydrocarbons. Benzo(3-4)pyrene, anthracene, and 1,2-benzanthracene were found in every sample; chrysene and pyrene occurred with a frequency of nearly 90%. About 40-50% of the compounds identified were carcinogenic. The correlation between variation in benzo(3-4)pyrene content and the concentration of other hydrocarbons was weak with the exception of pyrene. Each polycyclic aromatic identified is tabulated in terms of ambient concentration and its percentage of occurrence. (Author conclusions modified)

53731 **APTIC NO. 77652**

Leonard, M. J., E. L. Fisher, M. F. Brunnelle, and J. E. Dickinson

EFFECTS OF THE MOTOR VEHICLE CONTROL PROGRAM ON HYDROCARBON CONCENTRATIONS IN THE CENTRAL LOS ANGELES ATMOSPHERE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p. 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-54.3.)*

The effect of the motor vehicle control program on ambient hydrocarbon concentrations in the Los Angeles metropolitan area during peak traffic hours was determined. The data are from gas chromatographic analyses of air samples taken in 1963-1965, before implementation of the exhaust control program for new motor vehicles, and in 1971 and 1973, after several years application of this program. The average concentration and relative percent comparisons for methane, ethane, n-butane, isopentane, carbon 3 plus paraffin, ethene, propene C4 plus olefin, acetylene, benzene, and toluene are tabulated and discussed. Hydrocarbon emissions from motor vehicles are reduced 47.6% and there is a 51.8% reduction in the 1973 ambient total hydrocarbon concentration since 1963-1965. (Author abstract modified)

53732 **APTIC NO. 78095**

Morimura, H. and K. Funamoto

RELATIONSHIP BETWEEN CONTINUOUS DETERMINATION OF SMALL ION IN URAWA CITY AND PHOTOCHEMICAL SMOG WARNING. *(Urawa-shi ni okeru sho ion nodo renzoku sokutei to kokagaku sumogu chuiho, keiho hatsurei to no kankei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 13:133-137, 1975. 5 refs.*

The concentration of small ion was measured in Urawa during the period of July 1 to September 30, 1974. In this period, smog warnings and alerts were issued 16 times in southern Saitama. The small ion concentration was obtained by polar conductivity assuming that the mobility of small ion was constant. No relationship was found between small ion concentration and nitric oxide, nitrogen dioxide or sulfur dioxide concentration, and the relationship to oxidant concentration was not clear. The small ion concentration decreased with an increase in Ox concentration, due to the increased extinction of ions with increasing aerosol concentration.

53733 **APTIC NO. 78276**

Pierce, Donald C. and Morris Katz

DEPENDENCE OF POLYNUCLEAR AROMATIC HYDROCARBON CONTENT ON SIZE DISTRIBUTION OF ATMOSPHERIC AEROSOLS. *Environ. Sci. Technol., 9(4):347-353, April 1975. 15 refs.*

The dependence of polynuclear aromatic hydrocarbon (PAH) content on the particle size distribution of atmospheric suspended particulate matter was investigated. Ambient aerosols were collected in specific time periods during 1972 and 1973 using size fractionating cascade impactors at five sites in Toronto, Ontario. Collected particulate matter was extracted with benzene in a Soxhlet apparatus. Eight PAH s and two oxygenated arenes were separated by thin layer chromatography and identified and analyzed by absorption and fluorescence spectrophotometry. The efficiency and accuracy of the procedures involved were studied. The size distribution of PAH containing particulates follows approximately a log normal relationship for suburban and rural sampling sites with the majority of PAH content associated with particles below 3.0 micron diameter. There are significant variations in PAH content between downtown-urban, urban, suburban, and rural areas. The PAH concentration in submicron particles increases during the winter months. (Author abstract modified)

53734 **APTIC NO. 78183**

Rao, A. M. Mohan and K. G. Vohra

THE CONCENTRATIONS OF BENZO(A)PYRENE IN BOMBAY. *Atmos. Environ., 9(4):403-408, April 1975. 15 refs.*

The concentrations of the environmental carcinogen benzo(a)pyrene (B(a)P) in the atmospheric air of Bombay were measured. Thin layer chromatographic plates of silica gel C are used to separate the sample extracts. A spectrophotofluorometer is used for estimation using excitation wavelengths of 300 and 381 nm and emission wavelength of 410 nm for B(a)P. The highest concentration (400 micrograms/1000 cu m) is observed in the central parts of the city and is caused by a gas plant. Concentrations are in the range 7.1 to 16.2 micrograms/1000 cu m when the gas plant is not operating. The second highest concentration (100 micrograms/1000 cu m) is in an area near kilns, but only lasts for a few hours during the day. These and other figures are compared with similar data from other countries. Preliminary data on the size distribution of aerosols containing B(a)P is included. (Author abstract modified)

53735 **APTIC NO. 75927**

Riches, Michael, R., James T. Peterson, and Edwin C. Flowers

EFFECTS OF ATMOSPHERIC AEROSOLS ON INFRARED IRRADIANCE AT THE EARTH S SURFACE IN A NONURBAN ENVIRONMENT. *Environmental Protection Agency, Research Triangle Park, N. C., Meteorology Lab. and North Carolina State Univ., Raleigh, Dept. of Geosciences, Program Element 1AA009, ROAP 26AAS, Rept. EPA- 650/4-75-017, 43p., May 1975. 50 refs.*

NTIS: PB 243635/AS

Measurements of the hemispheric infrared downward-directed irradiance at the earth s surface and of ambient aerosol concentrations at a non-urban location were made to determine the extent to which incident hemispheric infrared radiation is affected by atmospheric aerosols. A Funk-type net radiometer was used to measure the incident all-wave energy. The observed solar radiation was subtracted from the all-wave energy to determine the infrared component. The expected incident infrared irradiance was calculated from prevailing atmospheric conditions. The observed-minus-calculated downwelling irradiances were then compared to concurrent measurements of turbidity, atmospheric extinction coefficient, and relative humidity. On a typical hazy summer afternoon with 0.250 turbidity and 0.2/km extinction coefficient, the excess downward-directed irradiance was approximately 0.03 langley/min (6% of typical downward infrared irradiances). There also appeared to be a nonlinear dependence of excess downwelling irradiance on relative humidity. (Author abstract modified)

53736 **APTIC NO. 77990**

Roberts, F. M., J. L. Gordon, D. L. Haase, R. E. Kary, and J. R. Weiss

VISIBILITY MEASUREMENTS IN THE PAINTED DESERT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-26.1.)*

Average seasonal, daily, and hourly visual range measurements made by photographic photometry in the Petrified Forest National Park, Arizona are reported. The visibility in the area is generally very good, with the mean visual range over the 1973-1974 year being 70 mi. Day to day fluctuations are large. The daily visual range exhibits a minimum in the morning followed by an increase to larger values in the afternoon. The diurnal pattern is correlated to nocturnal inversions, inversion break-up, and subsequent mixing of suspended particulate matter through large atmospheric depths. (Author summary modified)

53737 **APTIC NO. 77658**

Rote, Donald M. and Lawrence E. Wangen

ANALYSIS OF SUSPENDED PARTICULATES IN THE CHICAGO AREA BY PARTICLE SIZE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., p. 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-28.3.)*

An aerosol sampling program in the Chicago area is described in which samples were obtained as a function of particle size twice/wk at two or three urban and one non-urban site which is usually upwind of the city. The submicron and supermicron mass reaction depend significantly on wind speed, wind direction, and sampling location. A distinction in the wind speed dependence of the two particle modes is suggested by the data and supports theoretical expectations. The lower limit to the anthropogenic source contribution in the Chicago metropolitan area ranges from 8-33% of the total suspended particulates and that 50% or more of the observed total suspended particulates is due to sources located within the metropolitan area. The 9-month arithmetic average total suspended particulate, super-and submicron particulate concentrations at the non-urban site are 67.5, 40.5, and 27.4 micrograms/cu m respectively. The corresponding averages at one urban site are 85.7, 55.7, and 30.3 micrograms/cu m. (Author abstract modified)

53738 **APTIC NO. 77820**

Rubino, R. A., L. Bruckman, and J. Magyar

OZONE TRANSPORT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-07.1.)*

Measurements of elevated ozone concentrations, often above the National Ambient Air Quality Standard for photochemical oxidants, were measured in both urban and rural areas of Connecticut. During one episode on June 10, 1974, ozone levels first stabilized at values slightly above the standard and then rose sharply late in afternoon, reaching concentrations as high as 310 ppm (almost four times the standard) in Hartford. The trajectory of the air mass which arrived in Hartford at the time of maximum ozone occurrence appeared to originate from the metropolitan New York area during the early morning rush hour on the episode day. The advective transport of ozone and ozone precursors into Connecticut from New York was probably responsible for a significant portion (approximately two-thirds) of the elevated ozone concentrations measured throughout Connecticut on days when winds were from the south-southwest direction. The fact that peak ozone levels occurred late in the afternoon, several hours after maximum sunlight intensity, reinforced the conclusion that excessive ozone concentrations developed as a result of ozone and ozone precursor generation in the New York City vicinity followed by drift inland into Connecticut on the afternoon sea breeze. A regional hydrocarbon control strategy appears to be required if Connecticut is to meet the current oxidant standard. (Author abstract modified)

53739 **APTIC NO. 77881**

Sandberg, J. S., D. A. Levaggi, R. E. DeMandel, and W. Siu

SULFATE AND NITRATE PARTICULATES AS RELATED TO SO2 AND NOX GASES AND EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-62.5.)*

Five years (1969-1973) of sulfate and nitrate fractions were analyzed from high volume particulate samples at 8 stations in the San Francisco Bay Area. The sulfate and nitrate particulates closely track simultaneous emission inventory data, while sulfur dioxide (SO2) and nitrogen oxides (NOx) gas data vary more widely in response to local sources and to meteorological factors. The area-wide five year mean for sulfates is 2.68 microg/cu m, slightly above the remote nonurban sulfate background level. The similar five year nitrate mean, 2.78 microg/cu m, is well above the national urban average. A study at 3 stations in 1973 indicated that the sulfates are primarily in the fine (less than 0.65 micron) size range. A regression line was fitted to all station annual averages of sulfate versus SO2. Compared with a recent Environmental Protection Agency study for northeastern cities, the background is less than one quarter as high, but the slope is twice as great, best explained by photochemical species and processes accelerating conversion. The nitrate and NOx data yielded more complex and localized relationships. The generally low sulfate levels indicate the effectiveness of SOx control. The relatively high nitrate levels suggest that control strategy might place greater emphasis on NOx emissions. Distinct groupings of the higher sulfate levels in the north and nitrate levels in the south suggest that sub-basins requiring differing control emphasis may exist. The sulfate and nitrate data may serve as a basis for development of improved particulate standards. (Author abstract modified)

53740 **APTIC NO. 77836**

Simeroth, Dean C. and Gerald Bemis

DETERMINATION OF A FACTOR FOR STANDARDIZING AMBIENT CARBON MONOXIDE DATA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-45.3.)*

A factor for standardizing ambient carbon monoxide data measured at varying distances from roadways into equivalent concentrations at a uniform distance from the roadways was determined. Data were collected at a depressed highway section and at a grade highway section in the California South Coast Air Basin. Meteorological and traffic data were collected concurrently with the CO data. A step-wise multiple linear regression technique was used to test each variable for significance, using the CO data as the dependent variable. The only variables of significance were the distance from the center of the roadway and the atmospheric surface stability class. The standardization factor was determined from experimental relationships of CO concentration data to distance from the road. The use of the standardization factor to adjust ambient CO data to a uniform slant distance from the roadway reduced the variation in concentrations reported by air monitoring stations in the area. (Author abstract modified)

53741 **APTIC NO. 77965**

Volchok, H. L., L. Toonkel, and M. Schonberg

RADIONUCLIDES AND LEAD IN SURFACE AIR. *In: Appendix to Health and Safety Laboratory Environmental Quarterly, U. S. Energy Research and Development Administration, New York, Health and Safety Lab., 20p., July 1, 1975. 8 refs.*

NTIS: HASL-294 Appendix

The primary objective of the surface Air Sampling Program is to study the spatial and temporal distribution of stable lead and specific natural and man-made radio-isotopes in the surface air. Samples were collected on filters by 23 sampling stations in Greenland, the Americas, and Antarctica. Each sample was split into equal aliquots, one for non-destructive gamma counting and spectrometry and the other for radiochemistry. Concentration of the gamma emitting nuclides, beryllium 7, zirconium 95, cesium 137, and cerium 144, are determined by computer resolution of the gamma spectra. Spiked samples were used to test the accuracy of the radiochemical, spectrographic, and lead analyses; blank filters were submitted to check possible contamination; and duplicate samples were used to check analytical precision. Stable lead concentrations are reported for all sampling stations from 1966 to 1975. The activity concentrations for all of the radionuclide and gross gamma analyses completed to date are also reported.

53742 **APTIC NO. 77645**

Wroblewski, Sandra C. and Thomas A. Kowalski

AN EVALUATION OF THE RELATIONSHIP BETWEEN AMBIENT SULFUR DIOXIDE AND WATER-SOLUBLE SULFATE CONCENTRATIONS IN THE CITY OF CHICAGO. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual, Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.7.)*

Ambient sulfur dioxide and water-soluble sulfates were monitored at 16 trend sites in Chicago during 1966-1971 and 1974. A 74% decrease in ambient SO2 was observed from 1966 to 1974; while water soluble sulfates declined only 25% during the same period, refelecting a 66% reduction in the SO2/sulfate ratio. Annual correlation coefficients for the 7 yr ranged from 0.61 for 1968 to 0.09 in 1974. Concentration gradient maps for 1966 and 1974 illustrated dissimilar SO2 and sulfate density patterns across the city. Seasonal characteristics of both pollutants indicated a general lack of congruity. No simple relationship appeared to exist between ambient

SO2 and water-soluble sulfates in Chicago. (Author abstract modified)

53743 **APTIC NO. 78056**

British Dept. of Industry (Great Britain), Warren Spring Lab.

DEPOSIT GAUGE AND LEAD DIOXIDE OBSERVATIONS. OCTOBER 1973- MARCH 1974. *Preprint, 25p., 1974 (?).*

Monthly measurements of deposited dust and sulfation (lead dioxide method) are tabulated for over 100 sites in Great Britain. The measurements were made between October 1973 and March 1974. Each entry contains a site code, and reference to a table of site codes gives the type of area in which the observations were made. Some additional analyses of trace elements in deposited matter are also provided for certain sites.

53744 **APTIC NO. 78193**

Tochigi Research Inst. for Environmental Pollution, Dept. of Air Quality and Noise

SURVEY RESULTS FOR ATMOSPHERIC POLLUTANTS. *(Taikichi ni okeru osen busshitsu no chosa kekka ni tsuite). Text in Japanese. Tochigi-ken Kogai Kenkyusho Nenpo, (Annu. Rep. Tochigi Prefect. Res. Inst. Environ. Pollut., no. 1:78-90, Jan. 1975.*

Atmospheric pollutants (sulfur oxides; automotive emissions; hydrogen fluoride) were measured during 1971-1973, at various locations in Tochigi Prefecture, Japan. Concentrations of sulfur oxides were highest (0.033-0.087 ppm, 24-hr average values) in Ashio City, where copper mines are located. Elsewhere in the prefecture, SOx concentrations ranged from 0.002-0.014 ppm, at 20 locations. Automotive emissions (carbon monoxide, nitrogen oxides) were measured at 11 major intersections in the prefecture. From 1971 to 1973, some decrease was seen in the 8-hr average values of CO (4.4-10.7 ppm, 1971; 2.3-7.4 ppm, 1973). Average 24-hr values of nitrogen dioxide increased yearly from 1971 to 1973 (0.025-0.040 ppm, 1971; 0.033-0.076 ppm, 1973). Average 24-hr values of nitrogen monoxide ranged from 0.040-0.138 ppm in 1973. Traffic volume concentrations of airborne dust, lead, vanadium, and aldehyde were measured at 6 urban intersections in 1973. Types of vehicles were not differentiated. For an 8-hr sampling time, the number of vehicles ranged from 1154 to 3166. Ranges of pollutant concentrations were: dust, 0.26-0.96 mg/cu m; lead, 0.76-1.59 micrograms/cu m; vanadium, 0.09-0.14 micrograms/cu m; aldehyde, 0.01-0.05 ppm. In 1973, at 6 locations, 24-hr average values of HF ranged from 0.22-2.73 ppb, with measured values ranging from 0.14-7.15 ppb. There was no clear correlation between HF and plant damage.

53745 **APTIC NO. 78350**

Overall Survey Group for Environmental Pollution in Kashima Coastal Industrial Zone (Japan)

AIR POLLUTION DETERMINATION BY INHABITANTS. *(Taiki osen wa jumin no te de). Text in Japanese. In: Kashima--Danger of Environmental Pollution, p. 10-22, May 1975.*

Residents of the towns of Kashima and Kamisu spot-checked sulfur dioxide monitoring equipment (solution electrical conductivity method) in use at 13 monitoring locations in the area. Conditions leading to possible low readings were found (lack of hydrogen peroxide in the absorption solution; presence of atmospheric ammonia). In three cases, the company manufacturing the equipment had neglected to put H2O2 in the original absorbent solution. Total SO2 emissions have increased steadily from about 700 N cu m/hr in 1970 to more than 8000 N cu m/hr in 1972. However, environmental concentrations have remained at about 0.017 ppm from 1971 to 1972. Nitrogen dioxide concentrations were measured simultaneously at 95 locations during August 1974. Average NO2 values were about 0.01 ppm, but concentrations as high as 0.11 ppm were found in the town of Kashima. The presence of heavy metals in soil near Sumitomo Metals Co. was investigated. No particular increase in heavy metal concentrations was found from total soil analysis. However, when the presence of heavy metals was correlated to soil particle size, large quantities of iron, manganese, cadmium, zinc were found in soil samples taken nearer to the plant. Lead, nickel, and chromium also tended to be present in larger quantities. Maximum amounts of heavy metals were found in finest soil particles, below 0.05 mm in size. Highest concentration of zinc was over 600 ppm; manganese, over 700 ppm There was about 2.5% of cadmium and more than 20% of iron present in the finest soil particles. The extent of contamination of vinyl film, used for tunnel houses in farming areas near Kashima, was investigated. Light transmittance (300-800 nm) of the film was reduced drastically, to about 20% of the original value in the worst cases, resulting in stunted plant growth (pimiento, cucumber crops). Films had been used for 5 mo to 1 yr and 5 mo. Analysis of dust particulates on the Kashima vinyl film revealed the presence of heavy metals associated with steel-making, mainly iron.

1974

53746 **APTIC NO. 78254**

Aoyama, T., T. Sakai, and M. Hayakawa

FUNDAMENTAL STUDIES ON PHOTOCHEMICAL SMOG--A CONSIDERATION OF SECONDARY POLLUTANTS BY PHOTOCHEMICAL REACTIONS IN THE ATMOSPHERE. *(Kokagaku sumogu ni kansuru kisoteki kenkyu--Nijiosen busshitsu ni yoru osen no ichi kosatsu). Text in Japanese. Nagoya-shi Kogai Kenkyusho Ho (Rep. Environ. Pollut. Res. Inst. City Nagoya), no. 3:7-10, 1974. 10 refs.*

In order to investigate the relationships with photochemical smog, the concentrations of oxidant, formaldehyde, sulfur dioxide, and sulfuric acid mist in the air were measured in Nagoya from June to August 1973. The average concentrations were 0.011- 0.150 ppm for oxidant, 0.006-0.049 ppm for HCHO, 0.006-0.082 ppm for SO2, and 1.5-3.6 microgram/cu m for H2SO4 mist. The maximum concentration appeared most frequently at 10 am in the case of HCHO and 2-3 pm in the case of Ox. The correlation coefficient between HCHO and oxidant was 0.706. The H2SO4 mist concentration increased with the increase in SO2 and humidity. The HCHO and H2SO4 mist increased during the period of photochemical smog formation, and were related to the increase in oxidant concentration. The sodium rhodizonate method is effective for the measurement of H2SO4 mist.

33747 **APTIC NO. 78195**

Hashiguchi, T., H. Matsumoto, T. Kumamoto, S. Matsumoto, and N. Izumo

MONITORING OBSERVATIONS BY MOBILE POLLUTION MONITORING UNIT. *(Kogai sokuteisha ni yoru kanshi sokutei). Text in Japanese. Kagoshima-ken Kogai Eisei Kenkyusho Ho (Annu. Rep. Kagoshima Prefect. Inst. Public Health), p. 120-126, Aug. 1974.*

Atmospheric pollutants (sulfur oxides, airborne particulates, carbon monoxide, nitrogen oxides, hydrocarbons, oxidants) at 8-12 locations in Kagoshima Prefecture, Japan, were measured in 1973 by dispatching a pollution monitoring vehicle to the location, and taking measurements during 5 to 24-hr time period. There was no pattern to the time of day or the length of time during which measurements were taken. Because there was no suitable monitoring location in the area for airborne particulates, one set of measurements was taken at a point 10 m from a pollutant source. A set of measurements for oxidants was taken next to a gasoline stand. An inverse relationship was observed between the concentrations of nitrogen oxides and hydrocarbon concentrations. As one increased, the other decreased, and vice versa.

53748 **APTIC NO. 78363**

Komaki, Takashi

ON THE AIR POLLUTION OF KAGOSHIMA CITY. *(Kagoshima-shi no taiki osen). Text in Japanese. Kagoshima Daigaku Kogakubu Kenkyu Hokoku (Res. Rep. Fac. Eng Kagoshima Univ.), no. 16:41-51, Sept. 1974.*

The total particulate concentration in 12 areas of Kagoshima City including soluble and insoluble substances, was measured by the deposit cage method and sulfur oxides by the lead peroxide candle method. Other pollutants including tar, sulfate ion, and chloride ion were also measured. At places close to the Sakurajima volcano, the particulate concentrations were considerably higher and the particulates were mostly volcanic ashes. X-ray diffraction showed that the major components were rhombic feldspar and quartz. At locations close to the volcano the grain size of the particulates were larger than at the other locations. Substances from sea water such as calcium sulfate magnesium sulfate, and sodium chloride were also detected. The SOx concentration at some locations close to industrial areas was over 0.30 mg/day/sq m (0.82 mg/day/sq m at Kitakyushu city). Other locations also had high SOx concentration (0.22-0.28 mg/day/sq m).

53749 **APTIC NO. 78031**

Osherovich, A. L., N. S. Shpakov, and V. T. Zarubaylo

MEASUREMENT OF TOTAL OZONE CONTENT DURING THE TOTAL SOLAR ECLIPSE OF 10 JULY 1972. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz Atmosfery i Okeana), 10(11):755-757, Nov. 1974. 19 refs.*

Measurements of total ozone content during a total solar eclipse on July 10, 1972 were made with single- and two-channel ozone meters. The total ozone content were determined using direct solar radiation with the two-channel meter and radiation scattered by the region of the sky around the zenith in the case of the single-channel instrument. Variation in the amount of ozone during the eclipse was not symmetrical about totality. The lowest ozone content was about 0.276 cm before its increase to a maximum of around 0.32 cm, followed by a decrease to 0.258 cm. The relative change was about 5% in the former case and 11% in the latter case. The upward deviation from the average value of total ozone was about 10%. The measurements confirmed that a change in the total ozone content of the earth s atmosphere occurs during a total solar eclipse.

53750 **APTIC NO. 78312**

Sakai, Tetsuo and Taiki Aoyama

HEAVY METAL POLLUTION IN CITY AIR. *(Toshi taikichu ni okeru jukinzoku osen). Text in Japanese. Nagoya-shi Kogai Kenkyusho Ho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 3:23-28, 1974. 4 refs.*

Atmospheric heavy metal pollutants (lead, nickel, copper, manganese, iron) were measured at 16 locations in the City of Nagoya, Japan, during 1973-1974. Measurements were also made on airborne dusts at 3 locations. Low-volume air sampler and Andersen Air Sampler were used. Average dust concentrations ranged from 41-74 micrograms/cu m. Both dust and heavy metal concentrations were highest in the industrialized southern section of the city. Average ratios of heavy metal to dust were as follows: lead/dust, 0.0034; iron/dust, 0.013; manganese/dust, 0.00092. Average heavy metal concentrations (micrograms/cu m) varied as follows: lead, 0.15-0.33; copper, 0.025-0.074; manganese 0.035-0.116; nickel, 0.032-0.112; iron, 0.49-1.35. Dust size was finer at locations near the source. When monthly changes in pollutant concentrations were checked, dust, lead, copper, and nickel concentrations were lowest in January, while iron and manganese concentrations were lowest in February.

1973

53751 **APTIC NO. 77884**

Fedorowicz, J.

PRELIMINARY RESULTS OF TESTS ON POLLUTION OF ATMOSPHERIC AIR IN TORUN DURING THE PERIOD 1969-1972. *Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(2):54-61, 1973.*

NTIS: TT 73-54096/2

Determinations of the sulfur dioxide (SO2) content in the air were made once each month during 1971 by means of the contact method at ten control points located throughout Torun. The highest SO2 content was found near the Polchem Inorganic Industry Works, where the allowable limit was almost always exceeded. Almost all of the inhabitants of the area showed symptoms of SO2 poisoning, metal corroded rapidly, and plant life was totally destroyed. Dust fall was measured at 28 points throughout Torun in 1969 and 1970. Results from the two years were similar. The highest atmospheric dust levels occurred in regions with the highest concentration of buildings and greatest traffic. Data on annual dust fall collected at 35 stations in 1971 shows that the previously highly polluted center of the town now had relatively clean air. This decrease in dust fall was probably due to banning of wheel traffic along the main street of the town, and consequently to a decline in traffic along neighboring streets. In 1972 dust fall was measured along the railroad tracks and main streets. The amount of wheel traffic exerted a distinct influence on dust content in the air in a given neighborhood.

53752 **APTIC NO. 77855**

Ramaciotti, D. and C. Imhoff

ANALYSIS OF THE DESEASONIZATION RESULTS ON SULFUR DIOXIDE POLLUTION OF THE ATMOSPHERE RELEASED IN GENEVA BETWEEN 1959 AND 1971. *(Essai de desaisonnalisation des donnees de pollution atmospherique par l anhydride sulfureux, revelees a Geneve entre 1959 et 1971). Text in French. Praeventivmed., 18(6):379-384, 1973. 4 refs.*

The assessement of long-term trends of atmospheric pollution is difficult due to the influence of seasonal and short-term variations. By applying the Shiskin method of deseasonalization, it is possible to diminish the effects of the seasonal and occasional fluctuations. An analysis of data of average levels of sulfur dioxide registered in 19 different points in the canton of Geneva shows that pollution from domestic heating has two trends. Although there was a population increase in Geneva, the pollution due to SO2 decreased from 1959 to 1971, and the difference between winter and summer levels diminished.

53753 **APTIC NO. 78365**

Urabe, Tomoko, Yasushi Kodama, and Shin Ishinishi

THE QUANTITY OF BENZO(A)PYRENE IN SETTLING AND SUSPENDED PARTICULATES IN KITAKYUSHU CITY AND FUKUOKA CITY (REPORT NO. 14). *(Kitakyushu shi oyobi Fukuoka-shi ni okeru kokajin oyobi fuyujinchu no Benzo(a)pyrene-ryo ni tsuite (dai 14-ho)). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):141, April 1973.*

The measurements of benzo(a)pyrene in suspended particulates collected in Kitakyushu and Fukuoka between 1971 and 1972, and in settling particles collected between August 1969 and March 1971 in the same cities are presented. High volume samplers were installed at two locations in each of the two cities and dust samples were collected on glass fiber filter paper. Acetone extracted tar was refined and separated and spectrophotometry was applied. In previous years, the amount of benzo(a)pyrene in suspended particulates generally increased in the fall and winter and decreased in the summer, and the same amount of pollution was noted in commercial and industrial areas. But since 1970, these measurements have generally decreased. Benzo(a)pyrene in settling particles in Kitakyushu industrial districts were about 77.8 microgram/cu m/mo since 1966. But the average between November 1969 and October 1970 decreased to 24.7 microgram/sq m/mo. The amount in commercial areas was about one fifth that in industrial areas.

1972

53754 **APTIC NO. 78298**

Environmental Pollution Study Group. Atsumi Area

REPORTS ON THE AIR POLLUTION INVESTIGATED BY INHABITANTS IN ATSUMI. *(Atsumi no jumin ga shirabeta osen ni kansuru hokokusho). Text in Japanese. 114p., Sept. 1972.*

Air pollution conditions in the Atsumi area were investigated in 1971 by inhabitants of the area. The yearly average sulfur oxides concentration at five locations ranged from 0.008 ppm at Horikiri Elementary School to 0.019 ppm at the Municipal Office. The highest daily average concentration was 0.065 ppm at Wachi Elementary School. The largest polluter was Atsumi Power Plant where 5000 kl of crude oil containing 1.7% sulfur were burned each day. The air pollution conditions were much worse during the winter when W and NW winds prevailed. Formation of a strong inversion layer was frequent in winter. More sophisticated analytical apparatus was recommended for future investigations.

ATMOSPHERIC INTERACTION

1975

53755 **APTIC NO. 77767**

Bankoff, S. G. and E. L. Hanzevack

THE ADAPTIVE-FILTERING TRANSPORT MODEL FOR PREDICTION AND CONTROL OF POLLUTANT CONCENTRATION IN AN URBAN AIRSHED. *Atmos. Environ., 9(9):793-808, Sept. 1975. 22 refs.*

An adaptive filtering transport model for estimation and prediction of pollutant concentrations in an urban or regional airshed is developed. The program uses the method of fractional steps for direct numerical solution of the turbulent transport partial differential equation, coupled with a regressive least squares filter which estimates both the concentrations and a spatially distributed parameter for the adaptive feature at each time interval. The model is applied to historical data on sulfur dioxide concentrations in the Chicago area, and gives very good 4 hr predictions. (Author abstract)

53756 **APTIC NO. 78383**

Barnett, J. J., J. T. Houghton, and J. A. Pyle

THE TEMPERATURE DEPENDENCE OF THE OZONE CONCENTRATION NEAR THE STRATOPAUSE. *Quart. J. Roy. Meteorol. Soc. (London), 101(428):245-257, April 1975. 25 refs.*

Comparisons between ozone concentration and temperature were made at levels near 1 mb during an occasion of stratospheric warming. Measurements from two instruments on the Nimbus 4 satellite were used. There is a high correlation between O_3 concentration and temperature. Good agreement is found with a photochemical model which incorporates classical oxygen photochemistry together with reactions involving OH. (Author abstract modified)

53757 **APTIC NO. 78137**

Bauer, Ernest and Forrest R. Gilmore

EFFECT OF ATMOSPHERIC NUCLEAR EXPLOSIONS ON TOTAL OZONE. *Rev. Geophys. Space Physics, 13(4):451-458, Aug. 1975. 33 refs.*

The depletion of stratospheric ozone due to the injection of oxides of nitrogen from thermonuclear explosions in the atmosphere is reviewed. Emphasis is placed on the theoretical calculations, the ground based observations of global O_3 after the 1961-1962 multimegaton test series, and the satellite observations of local effects following an individual French thermonuclear explosion in 1970. There is general agreement on the approximate nitric oxide production per megaton yield and on the subsequent O_3 depletion expected to be associated with the various nuclear tests. The latter depletion is small, typically of the order of several percent during a reasonable observation interval and lies within the probable error of available O_3 measurements. Existing atmospheric data do not provide a statistically significant demonstration of the catalytic destruction of O_3 by NO_x. (Author abstract modified)

53758 **APTIC NO. 77657**

Bell, J. A., A. W. Castleman, Jr., R. Davis, and I. N. Tang

ASSOCIATION REACTIONS INVOLVED IN H_2SO_4 AEROSOL FORMATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p. 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, June 15-20, 1975, Paper 75-62.4.)*

Association reactions involved in the formation of sulfuric acid aerosols were investigated. Under some conditions reactions occur on surfaces and the sulfate products modify the size distribution of the preexisting particles. Or, the aerosol formation is initiated by homogeneous gas phase reactions. Attendant clustering reactions lead to the formation of new particles. New H_2SO_4 particle formation is comprised of three primary steps: oxidation of sulfur dioxide, reaction of sulfur trioxide with water to form H_2SO_4, and clustering of H_2SO_4 and water molecules to form prenucleation embryos, followed by the heteromolecular nucleation process. The results of these kinetic studies and the likelihood of particle formation under various atmospheric conditions are discussed.

53759 **APTIC NO. 77819**

Buffington, Paul D. and Ellen A. Bartczak

OZONE: CHEMICAL ACTION AND REACTION IN THE LOWER-LEVEL TRANSPORT WINDS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-07.7.)*

Ground level and airborne measurements of ozone were made in the Montgomery County, Ohio area. The airborne sampling values were in many instances higher than those recorded on the ground. The standard breaking point in the difference between ground-based monitoring and the airborne monitoring was between 1000 and 1500 ft in altitude. The production of ozone by free radical reactions within a moving atmospheric ozone reaction system was theorized to explain the observations, with submicron and micron size particulates being suspected as the catalyst for the reaction. The occurrence of dry reactions in lower level transport winds resulting in the production of ozone may necessitate the modifying of present regulations and standards for photochemical oxidants.

53760 **APTIC NO. 77835**

Burns, Rowland E.

DIFFUSION FROM A LINE SOURCE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-44.5.)*

A diffusion model for predicting pollution levels from a proposed interstate highway (line source) is used to assess the impact of vehicle emissions from the highway on ambient pollution levels. The traffic loadings and emission characteristics of vehicles on the highway are assumed to be known, and the diffusion of pollutants is treated by different sets of equations according to the direction of wind across the highway. Results illustrating the pattern of carbon monoxide near the road over a period of 8 hr indicate that under poor dispersal conditions the 8-hour CO standard is likely to be broken. The yearly distribution of nitrogen dioxide is also presented. Peaks of NO2 concentration occur at some distance from the interstate due to the fact that the chemical reactions which produce this pollutant take time for the conversion. The formed NO2 is then dispersed by diffusion at greater distances. The proposed model project is projected to result in the violation of clean air standards. (Author abstract modified)

53761 **APTIC NO. 78005**

Cadle, R. D. and G. W. Grams

STRATOSPHERIC AEROSOL PARTICLES AND THEIR OPTICAL PROPERTIES. *Rev. Geophys. Space Physics, 13(4):475-501, Aug. 1975. 149 refs.*

The tropospheric sources and effects of stratospheric aerosol particles are reviewed. The particles consist largely of volcanic ash for periods of possibly a few months following major explosive volcanic eruptions, but at otheer times they consist largely of impure sulfuric acid which may be in the form of droplets or crystals. The sulfuric acid is formed largely by the oxidation and hydrations of sulfur dioxide, much of which is introduced into the stratosphere by volcanic eruptions. The mixing ratio of the particles, at least of the larger one in the 0.1 to 1 micron radium interval, is almost always greatest a few kilometers above the tropopause. Stratospheric particles by absorbing and scattering radiation from the sun and earth can affect the atmosphere s radiation balance thereby affecting the climate. Another major effect of the stratospheric aerosols is the denial of radiation to the region below the stratosphere. (Author abstract modified)

53762 **APTIC NO. 77733**

Chock, David P. and Susanna B. Levitt

A SPACE-TIME CORRELATION STUDY OF OXIDANT AND CARBON MONOXIDE IN THE LOS ANGELES BASIN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-54.4.)*

The space time correlations of oxidant and carbon monoxide between various monitoring stations in the Los Angeles Basin were studied. The weekday hourly concentrations from the stations of the Los Angeles Air Pollution Control District were analyzed for the period of June through Sept. 1972 and 1973. Only weekday data are considered since the mean hourly concentrations are different for weekdays and weekends, especially for CO. In the afternoon when the wind transport is most important, oxidant has a transport length scale on the order of 55 km to the east of Los Angeles, while the scale is considerably shortened in the region north due to the mountain range. To the south, the transport length scale is shortened (15 km) due to high local nitric oxide concentrations and the Palos Verdes convergence. Distinct traffic flow influences the transport of oxidant in the sense it may cause oxidant depletion by the NO emissions from vehicles along the traffic flow. The CO correlation structure agrees with the general traffic flow pattern.

53763 **APTIC NO. 78078**

Chu, Kuang J. and John H. Seinfeld

FORMULATION AND INITIAL APPLICATION OF A DYNAMIC MODEL FOR URBAN AEROSOLS. *Atmos. Environ., 9(4):375-402, April 1975. 39 refs.*

A dynamic model for prediction of the spatial and temporal behavior of the size and chemical composition distributions of an urban air pollution aerosol is developed. Particular attention is given to the description of aerosol formation and growth in photochemical smog, in which the aerosol of interest lies primarily in the size range 0.1-1 micron diameter. The dynamic model developed is used to simulate aerosol number and mass concentrations and size distributions along several typical air trajectories on Sept. 20, 1972 in the Los Angeles basin. Predictions of the model are compared with a total aerosol mass concentrations computed from light scattering measurements. The sensitivity of the predictions to assumptions concerning the nature of gas to particle conversion processes is explored. (Author abstract)

53764 **APTIC NO. 78234**

Coulson, K. L. and Robert S. Fraser

RADIATION IN THE ATMOSPHERE. *Rev. Geophys. Space Physics, 13(3):732-737, 826-836, July 1975. 619 refs.*

A general review and extensive bibliography on factors affecting atmospheric radiation are presented. Topics discussed include: radiative transfer in realistic atmospheres, radiative energy budgets and the solar constant, the radiative properties of atmospheric aerosols and clouds, the radiation absorption spectra of atmospheric gases, solar radiation measurements and measurement instrumentation, the effect of coupling between radiative energy fields and meteorological circulation systems in the lower atmosphere, remote sensing techniques for the detection and characterization of atmospheric aerosols, the effect of turbulence on the propagation of light through the atmosphere, and the effect of air pollution on the radiative regime of an urban atmosphere.

53765 **APTIC NO. 78235**

Covert, D. S., R. J. Charlson, R. Rasmussen, and H. Harrison

ATMOSPHERIC CHEMISTRY AND AIR QUALITY. *Rev. Geophys. Space Phys., 13(3):765-771, 853-855, July 1975. 115 refs.*

Topics dealing with atmospheric chemistry and air quality are reviewed. Subjects discussed include: the presence of volatile and halogenated hydrocarbons in the troposphere and their interaction with ozone, photochemical oxidant transport, the significance of stratospheric ozone in relation to the earth s ultraviolet radiation budget, the effect of nitrogen oxides on stratospheric ozone, precipitation chemistry involving the influence of gas and particle chemistry on water vapor nucleation processes and climatological phenomena, particle scavenging by clouds and raindrops, nucleation mechanisms involving gas-to-particle conversion, subsaturation relative humidity effects on atmospheric chemistry, the effect of hygroscopic particle growth on light scattering and visibility, and the importance of more adequate air chemistry analysis in relation to defining the mechanisms of pollution-induced health effects.

53766 **APTIC NO. 78158**

Crutzen, Paul J., Ivar S. A. Isaken, George C. Reid

SOLAR PROTON EVENTS: STRATOSPHERIC SOURCES OF NITRIC OXIDE. *Science, 189(4201):457-459, Aug. 1975. 12 refs.*

The effect of solar proton events on nitric oxide in the stratosphere were determined. The production of NO during each of the solar proton events of Nov. 1960, Sept. 1966, and Aug. 1972 is calculated as comparable to or larger than the total average annual production of NO by the action of galactic cosmic rays. Solar proton events are important to the temporal and spatial distribution of ozone in the stratosphere. A study pf O3 distribution after such events is particularly important for validating photochemical diffusion models. (Author abstract modified)

53767 **APTIC NO. 77671**

Curran, Thomas C. and Neil H. Frank

ASSESSING THE VALIDITY OF THE LOGNORMAL MODEL WHEN PREDICTING MAXIMUM AIR POLLUTION CONCENTRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 19 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-51.3.)*

A graphical procedure for assessing the validity of the lognormal model when predicting maximum air pollution concentrations was developed. The procedure is based on the use of semi-log graph paper rather than the more commonly used lognormal probability paper. Semi-log plots place a greater emphasis upon the higher concentration ranges. Graphs of data for various pollutants are used to illustrate the techniques and to show how this information can be used to assess the validity of the lognormal approximation for extreme values. This provides a convenient guide to determine when the use of this model is appropriate for predicting maximum values. These graphs also illustrate the role of the geometric standard deviation in overpredicting maximum values. Overestimation of this quantity is a critical factor in the use of the lognormal model. The values of the geometric standard deviation indicate cases in which caution is required in predicting maximum values. (Author abstract modified)

53768 **APTIC NO. 77833**

Dabberdt, Walter F., Richard C. Sandys, and Patricia A. Buder

ISMAP - A TRAFFIC/EMISSIONS/DISPERSION MODEL FOR INDIRECT SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-44.3.)*

An indirect source model for air pollution which includes traffic flow and dispersion submodels for predicting line source emissions from roadways and area source emissions from parking zones and their impact on a given region s ambient air quality is described. The traffic analysis assigns facility traffic to alternative routes and adds facility traffic to through traffic counts. Travel patterns are determined on the basis of trip demand, intersection capacities, and phase lengths for actuated signals. The traffic flow analysis is rerun for consecutive hourly periods; accumulations of vehicles in parking lots and queues on streets are retained as initial values for subsequent periods. An intersection subroutine calculates delays at each intersection and street of the network. Outputs are average vehicle delay and queue length for each approach and turning movement. Parking areas or zones are defined within the parking lot and are assigned a potential for attracting and generating trips. The dispersion submodel is based on the use of a Gaussian point source formulation to treat line source emissions from roadways and area source emissions from parking zones. Up to 200 receptor locations can be specified for a single hourly run. The model is applied to the assessment of the air quality impact of three proposed additions to a multi-use facility (two office buildings and a motel). (Author abstract modified)

53769 **APTIC NO. 78177**

DeLuisi, J. J., B. G. Schuster, and R. K. Sato

SEPARATION OF DUST AND MOLECULAR SCATTERING CONTRIBUTIONS TO THE LIDAR OBSERVATION: A METHOD. *Appl. Opt., 14(8):1917-1923, Aug. 1975. 17 refs.*

A feasibility study is performed to explore the potential of the lidar observation as a tool for the study of the molecular and dust structure of the atmosphere. A computerized model of observation and solution is used to demonstrate a specific multiwavelength technique for separating the molecular and dust components of the lidar sounding up to 30 km. The solutions are sensitive to error noise and relative single strength of the dust and Rayleigh scattering and depend on the required spatial and temporal resolutions. The method of observation and solution requires the lidar to be operated at two zenith angles to measure atmosphere transmission. Except for the wavelength dependence, the solution is not model dependent. (Author abstract modified)

53770 **APTIC NO. 78043**

Edinger, James G.

METEOROLGOY AT GROUND LEVEL. *Intern. J. Chem. Kinet., vol. 1975:221-233, 1975. 1 ref. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Meteorological factors which affect the concentration of air pollutants at ground level over and downwind of large urban complexes are discussed in terms of transport, diffusion, and terrain effects. Transport is examined in terms of two surface air trajectories across the Los Angeles area. The first protrays typical conditions during the oxidant smog season, while the second trajectory depicts an air parcel with an unusually extended history of exposure to the urban pollution of Los Angeles. Examples are also presented illustrating how diffusion by the eddying motions of the turbulent low atmosphere leads to the progressive dilution of the air parcel with the surrounding atmosphere. Influences of terrain on both wind and eddy diffusion are also considered. The vertical oxidant distribution observed at El Monte downwind of Los Angeles and a few miles south of the slopes of the San Gabriel Mountain range is presented to illustrate how mountains can alter the transport of pollutants. (Author abstract modified)

53771 **APTIC NO. 77692**

Eid, Jon, Warren McPhail, Joann Ryan, and Harry D. Williams

IMPACT OF INDIANA POWER PLANTS ON AMBIENT AIR QUALITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-53.1.)*

The impact on ambient air quality (sulfur dioxide and suspended particulate) of the 23 large utility owned power plants in Indiana is evaluated to determine the priority for permissible high sulfur coal burning and possible supplementary control systems. The impact is assessed by dispersion modeling using the Air Quality Display Model. Predicted annual average concentrations are calibrated against continuous SO2 measurements for one complex of isolated power generating units. Maximum 24 hr concentrations are estimated using the Larsen transformation and are compared to the results of dispersion modeling which directly calculates 24 hr concentrations. (Author abstract)

53772 **APTIC NO. 78180**

Eliassen, Anton and Jorgen Saltbones

DECAY AND TRANSFORMATION RATES OF SO2, AS ESTIMATED FROM EMISSION DATA, TRAJECTORIES AND MEASURED AIR CONCENTRATIONS. *Atmos. Environ., 9(4):425-429, April 1975. 17 refs.*

Daily means air concentrations of sulfur dioxide and sulfate at several OECD ground sampling sites are computed using OECD SO2 emission data for Europe and a simple trajectory model which includes rates of decay and transformation of SO2. The rates of decay and transformation giving the best agreement between observed and computer concentrations are estimated. The estimated SO2 decay rate exhibits some variation around 0.00002/sec corresponding to a residence time of about half a day. The estimated rate of transformation to sulfate is about an order of magnitude smaller than the decay rate. (Author abstract)

53773 **APTIC NO. 77735**

England, Walter G., Lynn H. Teuscher, and R. Bruce Snyder

A MEASUREMENT PROGRAM TO DETERMINE PLUME CONFIGURATIONS AND ASSOCIATED GROUND LEVEL AIR POLLUTANT IMPACT AT THE BEAVER GAS TURBINE FACILITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1975. 5 refs. (Presented at the Air Pollution Control Association, An-*

nual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75e53.3.)

The plume configurations and accompanying ground level air pollutant impact resulting from the operations of the Beaver Gas Turbine Facility at Port Westward, Oregon were determined. Comparisons were made with standard EPA empirical formulae resulting in two modified formulae which generally characterize the plume rise for the gas turbines within + or - 25% under neutral and stable conditions. Based on sulfur hexafluoride measurements, the ground level impact of the operating facility is clearly negligible. Maximum 1 hr and 3 hr equivalent pollutant concentrations are less than 0.5% of the 3-hour sulfur dioxide standard and less than the allowable annual nitrogen dioxide concentrations by a factor of 2.7. (Author abstract modified)

53774 APTIC NO. 77831

Fay, James A. and King D. Eng

WAKE-INDUCED DISPERSION OF AUTOMOBILE EXHAUST POLLUTANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-44.1.)*

A mathematical model of the wake-induced dispersion of automobile exhaust pollutants is described. The model describes the growth of a two-dimensional turbulent wake downwind of a highway on a level terrain. This wake develops as a consequence of the turbulent motions induced by the passage of individual vehicles. An entrainment model is used to predict the scaling law for such wake growth. On and near the highway, the functional form of the scaling law for ground level pollutant concentration is derived. The model defines an upper limit to the pollutant concentration since natural atmospheric turbulence is ignored. Wind tunnel measurements of wake thickness and tunnel floor concentration correlated with the theoretical expressions derived from the flow model as did a limited number of field measurements of carbon monoxide concentration. (Author abstract modified)

53775 APTIC NO. 78168

Fegley, Ronald W. and Howard T. Ellis

OPTICAL EFFECTS OF THE 1974 STRATOSPHERIC DUST CLOUD. *Appl. Opt., 14(8):1751-1752, Aug. 1975. 3 refs. (Presented at the Optical Society of America, Spring Conference, Anaheim, Calif., 1975.)*

The sources and effects of the 1974 stratospheric dust cloud at the Mauna Loa Observatory near Hilo, Hawaii were determined. Maximum backscatter coefficients were attained in late October and early November when the cloud was very thin, typically 0.8 km thick. Photographs of the solar arueole reveal little pronounced forward scattering indicating that the particulates are extremely small, less than 0.3 micron. There are two major periods of strong optical backscatter. The first followed 3 wk after the eruption of the de Fuego volcano in Guatemala. The second occurred during February when there was a major volcanic eruption of Mt. Ngauruhoe in New Zealand. Another interesting feature of the observations is an apparent 3-week cycle in the layer backscatter. If one assumes an easterly wind of 85 km/hr in this lower region of the stratosphere, then it should take the cloud about 3 wk to encircle the globe. This may be the explanation of the cyclic behavior. There is an apparrent upward trend of the average layer backscatter. This implies either a change in the optical properties of the aerosol or continued injection of dust by one or more sources.

53776 APTIC NO. 78068

Fernald, F. G., G. B. Schuster, E. F. Danielsen, and D. G. Deaven

SYNOPTIC SCALE VARIABILITY IN THE DISTRIBUTION OF STRATOSPHERIC AEROSOLS AS REVEALED BY AIRBORNE LIDAR. *Opt. Quantum Electron., 7(3):141-145, May 1975. 7 refs.*

Synoptic scale variability in the distribution of aerosols within the lower stratosphere was examined with ariborne lidar during an April 1973 flight between Madrid and Washington, D. C. A basic problem in the analysis of stratospheric lidar observations was to separate the effects of the molecular atmosphere on the net lidar return from those of the aerosols suspended within this atmosphere. When lidar observations were made along a flight path were radiosonde observations were sparse, the density profiles were derived from three-dimensional analyses of the hemispheric distribution of radiosonde data. Density profiles and vertical cross sections of meteorological variables used in the study were obtained from computer analyses on isentropic surfaces. The lidar was fired once every 6-8 sec or approximately once every nautical mile along the flight path. A layer of relative minimum aerosol concentration was observed between 15 and 17.5 km, and a relative aerosol maximum was observed to oscillate between 21 and 23 km. Horizontal gradients in aerosol concentration were not obtained with confidence due to inherent uncertainties in calibration procedures and a lack of corraborative evidence.

53777 APTIC NO. 77969

Fortems, Courtney C.

COMPUTER SIMULATION OF EFFLUENT SULPHUR DIOXIDE PLUMES IN THE WHITECOURT AREA. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 32-41. 10 refs. (Jan. 16-17.)*

Computer modelling techniques were used to evaluate dispersion processes in the Whitecourt area. The model utilized is based on a simplification of the momentum balance equation. It gives numerical solutions to the three dimensional material balances describing wind flow and pollutant diffusion. The concept of effective stack height has been adopted to account for plume rise. The effect of topography on modifying the wind field is included in the model. Plume surveys were used to calibrate the model. Use of the model to predict pollution levels is discussed.

53778 APTIC NO. 77871

Frankenberg, Theodore T. and David B. Spiegler

AMBIENT POLLUTANT CONCENTRATIONS AND ASSOCIATION METEOROLOGICAL CONDITIONS FROM A POWER PLANT WITH TALL STACKS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.5.)*

Ambient sulfur dioxide concentrations near a power plant with tall stacks were analyzed to determine the relationship of the SO2 levels to plant emissions and meteorological conditions. Meteorological conditions were the dominant influence on ground level SO2 concentrations. There was no direct relationship between power plant emissions alone and ambient SO2 concentrations. During stable conditions, SO2 concentrations were generally low, indicating that emissions from the tall stacks occurred in or above the stable layer and did not reach the ground in the vicinity of the plant. Power plant emissions did contribute to observed ground level SO2 concentrations under some meteorological conditions, primarily during unstable atmospheric conditions occurring around the middle of the day. During an extensive period of non-operation of the plant, the average SO2 concentrations were slightly lower than with the plant in operation at most monitoring stations; at some stations, however, the SO2 levels were nearly the same. The present federal standards for SO2 were met at all monitoring stations in the vicinity of the plant. (Author conclusions modified)

53779 **APTIC NO. 77856**

Gay, Bruce W., Jr., Richard C. Noonan, Philip L. Hanst, and Joseph J. Bufalini

PHOTOLYSIS OF ALKYL NITRITES AND BENZYL NITRITE AT LOW CONCENTRATIONS--AN INFRARED STUDY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 30p., 1975 (?). 18 refs.*

The photolysis of methyl, ethyl, propyl, and benzyl nitrite at low concentration in air or oxygen was investigated. The products are analyzed by long-path infrared techniques. In all but the methyl nitrite photolysis the major product was a peroxyacyl nitrate type compound. The photolysis of methyl nitrite gives nitric acid as the major nitrogen-containing product, with formaldehyde, carbon monoxide, and formic acid as carbon- containing products. The carbon balance in all systems is good. The N2 balance becomes poorer as percentage of peroxyacetyl nitrate-type product decreases and nitric acid increases. The poor N2 balance is due to HNO3 absorption on the reactor surface. (Author abstract modified)

53780 **APTIC NO. 77942**

Goroch, Andreas K.

FLUORESCENT PARTICLES IN DIFFUSION STUDIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-32.4.)*

Studies on the simulation of diffusion of particulate clouds by fluorescent particle tracer techniques are reviewed. The studies center on various aspects of fluorescent particles relevant to their use as atmospheric tracers including size distributions, diffusion characteristics, and collection methods. Collection methods include membrane filters and rotorod samplers. The efficiency of the rotorod samplers was calculated theoretically and the dependence on particle radius and speed of rotation of the rods is found. Field trials were conducted to compare the efficiency of the rotorod sampler and the membrane filter. At Dugway Proving Ground, fluorescent particle tracer techniques are applied to sea breeze phenomena, particulate transport over different types of vegetation, and behavior of particulates over urbban areas. (Author abstract modified)

53781 **APTIC NO. 77882**

Graedel, T. E., L. A. Farrow, and T. A. Weber

KINETIC STUDIES OF THE PHOTOCHEMISTRY OF THE TROPOSPHERE. IV. POTENTIAL AEROSOL PRECURSORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 39 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-62.6.)*

An extensive chemical kinetic calculation including specific treatment of many minor species is performed for the urban troposphere and the results assessed in light of the possibilities for homogeneous nucleation. The sulfurc acid concentrations that result are sufficient to produce heteromolecular homogeneous nucleation with water vapor, but at rates too low to provide a significant sink for gaseous sulfuric acid. Nitric acid is present at ppb levels, but its high vapor pressure renders its participation in tropospheric homogeneous nucleation unlikely. The potential aerosol precursors, formic acid, acetic acid, methanol, ethanol, and several organic nitrates, have combinations of low concentration and high vapor pressure such that their participation in homogeneous nucleation processes is improbable. However, given the present uncertainties of nucleation theory, heteromolecular homogeneous nucleation of the methyl sulfinic acid-water vapor system may occur in urban tropospheres. (Author abstract modified)

53782 **APTIC NO. 77919**

Grandia, K. L.

THE USE OF A TWIN-ENGINE AIRCRAFT FOR DETERMINATION OF THE STRUCTURE AND CONCENTRATION OF EFFLUENT PLUMES. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 42-49. (Jan. 16-17.)*

A twin-engine aircraft has been instrumented for air chemistry measurements to determine the structure and concentration of effluent plumes. The data recovery system on the aircraft continuously records certain basic meteorological and aircraft performance parameters, in addition to the sampled effluent. A flight profile has been established which after recording the variables mentioned above, will yield a three dimensional structure of the effluent plume. The meteorological parameters are used to classify the atmospheric stability characterizing the plume. This type of sampling technique reveals consistent internal plume structure resolution. (Author abstract modified)

53783 **APTIC NO. 77650**

Guldberg, Peter H. and Richard D. Siegel

AIR QUALITY IMPACT MODELING PROGRAM FOR THE J. F. KENNEDY MEMORIAL LIBRARY ENVIRONMENTAL IMPACT STATEMENT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1975. 17 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-53.6.)*

An air quality impact modeling program was developed for the proposed J. F. Kennedy Memorial Library Complex in Cambridge, Massachusetts. The maximum carbon monoxide levels which could arise as a consequence of both adverse meteorological conditions and peak roadway traffic in the project area was evaluated. Detailed modeling simulations were conducted for the estimated year of completion of the Library Complex (1978) and for a future design year (1981) using the AORAC-1A urban diffusion model. Comparisons were made between the Build and No-Build situations to evaluate the differential impact of the project on community air quality. The project is judged consistent with the State Implementation Plan. (Author abstract modified)

53784 **APTIC NO. 77956**

Gutfreund, Paul D.

LIMITED MIXING AND INVERSION BREAKUP EVALUATIONS USING ROUTINE UPPER AIR AND SURFACE DATA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-04.2.)*

A numerical technique for evaluating concentrations of buoyant effluent releases from high stacks under dispersion conditions of limited mixing (trapping) and inversion breakup (fumigation) is described. The computerized technique uses routinely collected long-term upper air and surface data and projected monthly-diurnal load factors as input data. The numerical scheme is illustrated by applying the technique to the assessment of a proposed large fossil fuel plant, and sensitivity analyses are performed with respect to modeling assumptions. Run times for the calculational programs are about 50 sec for 5 yr of data. (Author abstract modified)

53785 **APTIC NO. 78392**

Hall, C. D.

THE SIMULATION OF PARTICLE MOTION IN THE ATMOSPHERE BY A NUMERICAL RANDOM-WALK MODEL. *Quart. J. Royal Meteorol. Soc. (London), 101(428):235-244, April 1975. 15 refs.*

Two types or random walk models which have been used to simulate turbulent motion are applied to the low level diffusion of particle clouds in the atmospheric boundary layer. Models that have a step length of the same order as the scale of turbulence do not predict sufficient vertical diffusion, and an excessive concentration peak is formed at the surface. If the step size is reduced an a correlation introduced between successive particle velocities, results are obtained for neutral stability which compare favorably with observation. An extension to unstable conditions can be made if a suitable dependence of important turbulence parameters on L is postulated. Although random walk models can produce satisfactory results in well defined conditions, much empiricism is used which limits their application to more general problems. Their main advantage is that statistics of turbulent motion, which are not readily deduced from solutions to the diffusion equation, can be easily calculated. In practice, computing time restricts the application to one and two dimensional simulations of particle trajectories over short or medium ranges. (Author conclusions modified)

53786

APTIC NO. 78291

Hidy, G. M. and C. S. Burton

ATMOSPHERIC AEROSOL FORMATION BY CHEMICAL REACTIONS. *Intern. J. Chem. Kinet., vol. 1975:509-541, 1975. 67 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Atmospheric aerosol formation processes are reviewed, with particular emphasis on sulfate and nitrate formation and the occurrence of organic carbon material. Observations during smog episodes in the Los Angeles area indicate that the reactions most significant in relation to submicron sulfate are homogenous in nature and either involve a dark reaction of ozone and olefins or free radical reactions such a hydroxyl attack on sulfur dioxide. There appear to be two extremes for the behavior of nitrate formation in the Los Angeles area: first a short term transient production accompanying the nitrogen oxide peak in the morning and second a much slower but systematic production such that high concentrations of nitrate appear after 2-3 hr of air mass transport across the Los Angelse Basin. Although nitrate formation in the troposphere is difficult to interpret, ammonia appears to play a crucial role if acids are involved. The absence of nitrates in stratospheric aerosols appears to be related to the high volatility of nitric acid. Organic carbon fractions are significant in terms of reactions between ozone and cyclic or linear olefins of a carbon number larger than six. Most of the noncarbonate carbon found in smog aerosol is secondary in nature and is made up of a substantial amount of oxygenated material. In Los Angeles, the organic fraction is normally the largest contributor by mass to filter collected aerosol samples.

53787

APTIC NO. 78009

Hiser, H. W., G. F. Andrews, and H. V. Senn

RADAR MEASUREMENT OF SMALL SCALE TURBULENCE AND THERMAL STABILITY IN THE LOWER ATMOSPHERE. *J. Air Pollution Control Assoc., 25(8):835-838, Aug. 1975. 5 refs.*

The monitoring of small scale turbulence and thermal stability in the lower atmosphere using microwave pulsed radar is discussed. Special video analysis equipment is used which monitors the amplitude and fluctuations of reflected signals from stable, stationary objects in the vicinity of the radar. Long and short period fluctuations are observed on the order of 1000 to 0.1 min. The long period fluctuations are manifestations of slow changes in the temperature lapse rate, and the short period ones of small scale turbulence in the lower atmosphere. The average strength of reflected signals increases as the lapse rate of temperature decreases in the lower atmosphere. Although atmospheric moisture content enters into the radio refractive index, apparently the highest average signal strengths are associated with ground based or low altitude temperature inversions. Suitable radars presently exist in or near most metropolitan areas. (Author abstract modified)

53788

APTIC NO. 77779

Hunt, J. C. R. and H. Fernholz

WIND-TUNNEL SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER: A REPORT ON EUROMECH 50. *J. Fluid Mech. (Cambridge), 70(part 3):543-559, Aug. 12, 1975. 50 refs.*

Papers on wind tunnel simulation of the atmospheric boundary layer presented at Euromech 50 are summarized. The papers describe and analyze different methods of simulation of neutral, stable, and unstable atmospheric conditions in various types of wind tunnel. Numerous applications of wind tunnel simulations are described. Conclusions are drawn about the validity, the techniques, the limitations, and future developments of wind tunnel simulations. The characteristics of the wind tunnels and relevant measurements of the simulated atmospheric boundary layers are listed to enable comparisons to be made between different techniques. (Author abstract modified)

53789

APTIC NO. 77943

Jepsen, Anders F. and Charles L. White, Jr.

A COMPARISON OF DYNAMIC AND STATIC AIR POLLUTION MEASUREMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-58.1.)*

Air pollution data gathered in the dynamic mode to map the true dispersal pattern of an effluent plume from a Maryland power plant are analyzed and compared to data gathered in the static mode at a point in the plume occupied by the static monitor. There is a difference between static and dynamic measure of average concentration. While the static system is experiencing a phenomenon which changes only due to atmospheric conditions, the dynamic system is regularly experiencing variation from and to a low concentration background. The system is likely to be indicating a level less than the actual concentration due to the lack of time available to respond to it. An explanation of the difference between static average and dynamic gased estimated average may lie in the actual character of the plume. When the plume appears Gaussian, using a simple Gaussian distribution based on centroid and second moment around the centroid may not fit the actual data closely enough, and a more complex fitting routine may be necessary. If the plume is non-Gaussian, then an estimate based on Gaussian statistics is not likely to be valid at all. The dynamic data are a good indicator of average conditions at the site of the static monitor. They describe the general air quality condition across the plume and indicate the worse case conditions as well.

53790

APTIC NO. 77783

Johnston, Harold S.

GROUND-LEVEL EFFECTS OF SUPERSONIC TRANSPORTS IN THE STRATOSPHERE. *Accounts Chem. Res., 8(9):289-294, Sept. 1975. 35 refs.*

The ground-level effects of supersonic transports in the stratosphere are reviewed. The primary natural process for nitrogen oxides removal from the stratosphere is reversible conversion to nitric acid, transport of nitric acid into the troposphere, and rainout in the troposphere. Over a period of 2 yr, the nitric acid profiles were measures from northern Alaska to southern South America. From the observed gradient or nitric acid vapor and from a model of air motions calibrated against the removal of radioactive debris from the stratosphere, the removal rate of NOx from the stratosphere is calculated to be between 0.5 and 1.5 Mton of nitrogen dioxide per year. Solar radiation is absorbed by ozone in the stratosphere scattered by air molecules in the troposphere, and strongly scattered by particles and by clouds in the troposphere. For a given distribution of O3 and particles, the transmission and scattering of solar radiation are strong functions of solar angle.

53791 **APTIC NO. 78129**

Johnston, Harold S. and Gary Whitten

CHEMICAL REACTIONS IN THE ATMOSPHERE AS STUDIED BY THE METHOD OF INSTANTANEOUS RATES. *Intern. J. Chem. Kinet., vol. 1975: 1-26, 1975. 30 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The photochemistry of ozone in the stratosphere was studied using the method of instanteous rates. By a Monte Carlo method it is very improbable that random experimental errors in the basic kinetic constants are responsible for the failure of the classic Chapman mechanism and air transport to account for the natural O3 balance. It is probable that the observed concentration of nitrogen dioxide in the stratosphere is sufficient to account for the natural O3 balance. There is a strong latitude dependence on the sensitivity of stratospheric O3 to catalytic destruction by the oxides of nitrogen. Considerations based on the classic photochemical sector method show that there is no average intensity over the diurnal cycle that is appropriate for stratospheric O3. The crossover point between O3 formation from the methane-nitrogen oxides smog reaction and O3 destruction by NOx catalysts occurs at about 13 km in temperature latitudes. (Author abstract modified)

53792 **APTIC NO. 77937**

Koenigshofer, Daniel R.

AN ANALYSIS OF LONG-RANGE TRANSPORT USING TRACE METALS IN RAINWATER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-17.1.)*

A technique for tracing pollutants found in rainfall back to distant sources or source regions is described along with some preliminary results of field tests. The method consists of three phases: precipitation collection at a rural site; analyses of the samples to determine the concentrations of zinc, cadmium, lead, and copper using anodic stripping voltammetry; and tracking the path of the storm with 850 millibar wind data in a reverse trajectory computer program. Correlations between metallic concentrations in rainwater and storm path can be linked to distant sources to determine their relative effects if the distribution of the sources of these trace metals within 500 km of the receptor site is known. Preliminary results show storms approaching from four distinct regions, and within each region metallic concentrations are highly consistent. Correlation of these results with distant sources is inconclusive based on the preliminary data. However, more resolution in the technique can be achieved with more precise emission information and sufficient trajectory-metallic concentration data to allow for a statistical analysis. (Author abstract modified)

53793 **APTIC NO. 77970**

Krey, P. W. and R. J. Lagomarsino

STRATOSPHERIC CONCENTRATIONS OF SF6 AND CCL3F. *In: Health and Safety Laboratory Environmental Quarterly. Energy Research and Development Administration, New York, Health and Safety Lab., p. I-97-I-123, July 1975. 18 refs.*

NTIS: HASL-294

Because of the chemical inertness of freon-11 and sulfur hexafluoride in the environment, their concentrations in the stratosphere were measured as part of a study of global atmospheric diffusion. Compressed air samples were recovered from the stratosphere by aircraft. The SF6 and freon were concentrated and determined by gas chromatography. The stratospheric concentrations of freon and SF6 are given. The two trace gases behave similarly in the stratosphere. Although the Northern Hemisphere is the primary source of these gases, the similarity of their hemispheric distributions suggests a rapid interhemispheric exchange. The SF6 results are important because they demonstrate that halocarbons other than the freons have penetrated the stratosphere. The trace gas concentrations decrease with increasing altitude above the tropopause. Freon and SF6 concentrations in the stratosphere have spatial and seasonal distributions which are similar to lead 210 distributions from radon emanation at the earth s surface. An atmospheric box model is developed which indicates from the observed inventories that the photolytic half life of a freon 11 molecule in the stratosphere is 2 to 4 yr and the total atmospheric half life is 12 to 24 yr. (Author abstract modified)

53794 **APTIC NO. 78163**

Larson, Timothy V., Robert J. Charlson, Eric J. Knudson, Gary D. Christian, and Halstead Harrison

THE INFLUENCE OF A SULFUR DIOXIDE POINT SOURCE ON THE RAIN CHEMISTRY OF A SINGLE STORM IN THE PUGET SOUND REGION. *Water, Air, Soil Pollut., 4(3/4):319-328, July/Aug. 1975. 15 refs.*

Sampling and chemical analysis of a rainstrom were undertaken to determine the influence of a large source of sulfur dioxide on regional precipitation chemistry. With a southerly wind, there are only two major SO2 sources upwind of the sampling area: the smelter and a coal-fired power plant located 120 km south- southeast of the smelter. During the sampling period, the smelter was emitting 5 kg/sec of SO2 and the power plant 2 kg/sec. There is a definite correlation between hydrogen ion, sulfate ion, and arsenic concentration increases downwind of the source. Estimated sulfur deposition in a 1500 sq km downwind area is compared to existing models. (Author abstract modified)

53795 **APTIC NO. 77755**

Lawson, T. V.

THE INTEGRATION OF AN ENVIRONMENTAL WIND INVESTIGATION WITH A NEAR FIELD POLLUTION STUDY. *Atmos. Environ., 9(9):867-870, Sept. 1975. 4 refs.*

The integration of an environmental wind investigation with a near field pollution study is discussed. The objective of an environmental wind investigation is to identify those locations at which the wind velocities are excessively high. These high velocities occur in strong wind conditions when the assumption of a neutral atmosphere is reasonable. The modeling of this type of atmosphere in a wind tunnel is normal practice and environmental wind investigations on projected layouts are becoming common occurrences. The same investigation should be used to prevent the discharge of effluents into areas which could become pockets of pollution. The highlights of the environmental wind study at Bristol are explained to show how these studies can be integrated.

53796 **APTIC NO. 77777**

Leahey, D. M.

AN APPLICATION OF A SIMPLE ADVECTIVE POLLUTION MODEL TO THE CITY OF EDMONTON. *Atmos. Environ., 9(9):817-823, Sept. 1975. 9 refs.*

A simple advective model is applied to Edmonton, Alberta for the prediction of ground level nitrogen oxides concentrations. Routine wind observations and air quality measurements are used to evaluate the model. All calculations are performed by hand. An analysis of over 300 hr of observations show that the model predicted with errors, on the average, of a factor of 1/2. The correlation coefficient between 310 predicted and observed average hourly NOx concentrations is in excess of 0.60. Predictions of carbon monoxide were also made using the advective model and are similar to those of the NOx predictions. The model predicts with errors, on the average, of a factor 1/2. (Author abstract modified)

53797 **APTIC NO. 77945**

Levitt, Susanna B. and David P. Chock

WEEKDAY-WEEKEND POLLUTANT AND METEOROLOGICAL STUDIES OF THE LOS ANGELES BASIN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-51.1.)*

Pollutant data from the Los Angeles Basin was analyzed for the smog months of June-Sept. 1972 and 1973 to determine if there is a direct relationship between traffic volume and oxidant concentration levels. Nitrogen dioxide, particulates, and the primary pollutants (hydrocarbons, nitric oxide, and carbon monoxide) are significantly reduced on the weekend. Three broad regional patterns are observed for oxidant. Sites further inland tend to have higher weekday temperatures and lower relative humidities in the morning. Both the solar radiation and the particulate levels have higher weekday values. A contributing factor to the higher solar radiation is the lower weekday relative humidity. While decreasing traffic volume reduces the concentrations of the primary automotive pollutants, it does not necessarily result in lower oxidant levels. (Author abstract modified)

53798 **APTIC NO. 78034**

London, Julius

THE THERMAL STRUCTURE AND DYNAMICS OF THE STRATOSPHERE. *Intern. J. Chem. Kinet., vol. 1975:85-99, 1975. 48 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-19, 1974.)*

Chemical processes related to the thermal structure and dynamics of the stratosphere are discussed. The sink for thermal energy in the stratosphere is mainly through radiative emission by carbon dioxide in the 15 micron bands: thus, its concentration is of considerable interest particularly for the long term stratospheric energy budget. Ozone strongly absorbs near ultraviolet solar rediation and also plays a dominant role in determining the thermal structure of the stratosphere. Ozone variations are largest in the subpolar regions during the winter when the temperature and wind variations in the lower stratosphere are also the largest. There is little water vapor in the stratosphere, although occasional clouds are formed in the middle stratosphere at high altitudes during the winter. Water vapor in the stratosphere is reasonably well mixed, with a mixing ratio of about 4-5 ppm (by volume) at 15 km. Additional trace gases in the stratosphere which by themselves exert very little direct input to the radiative budget but either directly or indirectly influence the local concentrations of ozone, water vapor, and/or carbon dioxide include nitric oxide, nitrogen dioxide, atomic hydrogen, hydroxyl radical, and hydroperoxyl radical. The stratosphere also contains a relatively high concentration of aerosols at a height of about 20 km, and stratospheric aerosol is capable of affecting the backscattering of solar radiation by atmospheric particles and thereby changing the overall albedo of the earth-atmosphere system. Aerosols can also contribute slightly to the radiation budget of the lower stratosphere, depending on the refractive index of the aerosol particles.

53799 **APTIC NO. 78112**

Macnicol, Bettye F. and A. N. Scott

COOGEE AIR POLLUTION STUDY, WESTERN AUSTRALIA. *Clean Air, 9(2):33-37, May 1975. 4 refs.*

The objectives of the Coogee Air Pollution Study were to measure the present pollution levels and to predict possible future levels over an area of land under consideration for residential development. Wind speed, wind direction, temperature, humidity, sulfur dioxide, and dust were measured. Smoke flares and freon tracer were used to measure wind flow. Meteorological factors affecting pollution levels in the study area are discussed. The likelihood of severe pollution lasting beyond 24 hr is small in winter. A sea breeze from the southwest in the afternoon and evening takes emission products from a nearby industrial area over the study area during the summer. Two situations which cause unacceptable pollution levels in the study area were considered as extreme cases. The first involved an inversion and an afternoon sea breeze which brought pollutants into the study area. Looping of the plume from an electrical power station apparently caused an extra contribution of sulfur dioxide for a half hr during the afternoon which resulted in a total reading for the half hr of 1056 mg/cu m. The second case involved an accidental emission of sulfur trioxide from a nearby industry. This gas combined chemically with water vapor in the atmosphere to form a dense cloud of sulfuric acid droplets. Visibility was reduced to several hundred m or less up to 30 km from the source. The recommendation of the study that no residential development take place in the study area was accepted by the government.

53800 **APTIC NO. 77694**

Mage, David T.

AN IMPROVED STATISTICAL MODEL FOR ANALYZING AIR POLLUTION CONCENTRATION DATA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-51.4.)*

An improved statistical model for analyzing air pollution concentration data was developed. Stochastic terms are introduced for the meteorological and chemical processes of the atmosphere, and the diffusion equation is transformed into a Langevin equation. Air pollution concentration data are better described by a three parameter lognormal distribution, censored at the third parameter, (LN3C) of which the standard lognormal model is a special case. The new model was evaluated using air quality data for a varied variety of air pollutants (lead, carbon monoxide, ozone, hydrocarbons, sulfur dioxide) from San Jose, Cincinnati, Los Angeles, Washington, D. C., and Copenhagen. In all cases, the LN3C probability is superior to the standard LN2 probability model. An example is given using SO2 concentration data for Washington, D. C. (1961-1968), with parameters estimated by the method of maximum likelihood. (Author abstract modified)

53801 **APTIC NO. 77840**

Mamane, Yaacov and Jorge Pena

AEROSOL MEASUREMENTS OVER ST. LOUIS: SOME PRELIMINARY RESULTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-58.4.)*

Simultaneous measurements of aerosol, turbulence, solar radiation, and state parameters were taken over St. Louis, during summer, 1974, using the PSU Meteorology research aircraft as a platform. Vertical and horizontal flight soundings were designed to map in two dimensions below and above the mixing layer. Flights were taken during different parts of the day and in various meteorological conditions. The vertical distribution of the particle concentration, the scattering coefficient, and partially the relative humidity are highly affected by the temperature lapse rate. Comparision of three crosswind horizontal legs shows that downwind of St. Louis particle concentration, concentration of condensation nuclei and scattering coefficient are much higher than those obtained upwind of St. Louis. No large variations in aerosol profiles did happen during the same day. The ratio of condensation nuclei concentration to large particle concentration varies between 8-200 under polluted conditions in comparison to 100-5000 under clean conditions. (Author abstract modified)

53802 **APTIC NO. 78181**

McCollister, George M. and Kent R. Wilson

LINEAR STOCHASTIC MODELS FOR FORECASTING DAILY MAXIMA AND HOURLY CONCENTRATIONS OF AIR POLLUTANTS. *Atmos. Environ., 9(4):417-423, April 1975. 10 refs.*

Two related time series models were developed to forecast concentrations of various air pollutants and tested on carbon monoxide and oxidant data for the Los Angeles basin. One model forecasts daily maximum concentrations of a particular pollutant using only past daily maximum values of that pollutant as input. The other model forecasts 1 hr average concentrations using only the past hourly average values. Both are significantly more accurate than persistence, i.e., forecasting for tomorrow what occurred today (or yesterday). Model forecasts for 1972 of the daily instantaneous maxima for total oxidant made using only past pollutant concentration data are more accurate than those made by the Los Angeles APCD using meteorological input as well as pollutant concentrations. Although none of these models forecast as accurately as might be desired for a health warning system, the relative success of simple time series models, even though based solely on pollutant concentration, suggests that models incorporating meteorological data and using either multi-dimensional times series or pattern recognition techniques should be tested. (Author abstract modified)

53803 **APTIC NO. 77967**

Mohtadi, M. F. and E. Y. Gyuse

CHEMICAL TRANSFORAMTION PATHWAYS OF SO2 GAS IN THE ATMOSPHERE. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 20-29. 22 refs. (Jan. 16-17.)*

Sulfur dioxide is slowly photo-oxidized to give sulfur trioxide in the presence of oxygen and solar radiation between 2400 and 3400 A wavelengths. The presence of nitric oxide has a suppressive action on aerosol formation of SO2 in air. Paraffinic hydrocarbons form sulfinic acid with SO2 in air, but the rate is very slow. Olefins and the aromatics, especially toluene and xylene, have a suppressive effect on SO2 aerosol formation in air. Catalytic reactions of SO2 in air are by far the most rapid and therefore, the most important, chemical reactions that transform SO2 in air into sulfate particulates. They take place in fog droplets and are catalyzed by traces of transition metal ions or dust particles and ammonia. The presence of NH3 in the atmosphere speeds up the solution oxidation reactions of SO2 more than do metal ions. Rainout and washout are the two major processes by which SO2 is removed from the air by precipitation. The soil generally acts as a buffer, absorbing SO2 from the atmosphere when it is low in sulfur content and releasing hydrogen sulfide into the air when it is high in sulfur content. Tracers used for SO2 in air include antimony oxide, fluorescent pigments, water soluble fluorescent dye, halogen tracer, and radio-tracer. Direct photooxidation is not a major reaction pathway. Photooxidation of SO2 in the presence of nitrogen oxides and certain hydrocarbons is of some importance in some urban atmospheres. The bulk of atmospheric SO2 becomes converted through catalytic reactions in sulfate particulates.

53804 **APTIC NO. 78094**

Morita, K., H. Ishikawa, M. Kaneda, and T. Toriyama

AEROSOL OBSERVATION BY A PLANE. *(Hikoki ni yoru earozoru no kansoku). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 13:144-147, 1975. 1 ref.*

Results of vertical and horizontal distributions of aerosols measured in the area of Mikawa Harbor and Komaki by three flights, on February 11 and 12, 1974 are given. Concentrations of condensation nuclei and large particles and conductivity were measured at maximum altitudes of 1770 m, 2800 m and 2590 m. The effects of meteorological factors (clouds, wind direction) are described. The variation in altitude, condensation nuclei, conductivity, large particles and mixing ratio of water vapor with time showed a fairly definite inverse relationship between conductivity and condensation nuclei. However, the absolute value of conductivity was fairly low. The equivalent concentration line at 1400 m clearly indicated that the pollution originated in the Owase area.

53805 **APTIC NO. 77758**

Moss, Michael R.

SPATIAL PATTERNS OF PRECIPITATION REACTION. *Environ. Pollut., 3(4):301-315, June 1975. 18 refs.*

Spatial patterns of the precipitation reaction were analyzed using samples of precipitation for two urban, industrial centers, Sheffield, England and Welland, Ontario. Precipitation in Welland is considerably less acid than in Sheffield, but both sites are less acid than many rural areas. The similarity in the character of precipitation pH between these environments contrasts with urban environments where the character and the nature of precipitation pH vary markedly from urban area to urban area and within urban areas. There is a marked change in pH at about the general position of the rural/urban fringe which marks the change from precipitation influenced by many urban/industrial emission products to one influenced by the slow drift and conversion of atmospheric gases and their subsequent removal.

53806 **APTIC NO. 77768**

Neumann, J.

TURBULENT DIFFUSION OF POLLUTANTS FROM SOME PLANE AREA SOURCES. *Atmos. Environ., 9(9):785-792, Sept. 1975. 7 refs.*

The concentration in air of pollutants generated by plane area sources of regular shape is calculated for points downwind along the wind parallel symmetry axis of the area source for distances with large diffusion time. The Lagrangian theory for isotropic turbulence is used. The results are valid for downwind distances greater than 500 m. Simplification of the mathematical treatment requires the area source to be elongated along the wind. At the intermediate distances, assuming equal areas and source strengths and identical meteorological conditions, ellipitcal areas produce lower downwind concentrations than rectangular sources. Triangular shapes (with a vertex pointing downwind) produce considerably lower concentrations. The results are useful for estimating concentration levels downwind of cities for pollutants generated at low altitudes (motor vehicles) and for planning the shape and size of oxidation ponds. (Author abstract modified)

53807 **APTIC NO. 77734**

Nicholson, David L. and M. Lunn Marple

A POLLUTION FORECASTING ALGORITHM BASED ON BAYESIAN STATISTICAL METHODS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-51.7.)*

A method to develop a pollution forecasting algorithm based on Bayesian statistical methods is descrbed. The methodology concentrates on the direct use of the monitoring data base which exists in many cities. After modeling the hourly pollution readings as independent random variables, a reasonable probability density function is selected. Based on the specifications of legality contained in the Clean Air Act, the data base generated by monitoring programs is used to establish legal and illegal pollution data sets. Data taken on legal days (no violations) followed by another legal day constitutes the legal data set while legal data taken on a day followed by an illegal day (at least one violation) typiifies the illegal pollution process. Maximum likelihood estimation procedures are employed to jointly estimate the values of the parameters of the density function which best fit the function to each of the two data sets. Two density functions are developed which characterize the legal and illegal process. The forecasting algorithm is actually a binary hypothesis test which, based on the Bayesian criterion decides if legal data taken today will result in tomorrow s readings leading to a violation or not. (Author abstract modified)

53808 **APTIC NO. 78004**

Oran, E. S., P. S. Julienne, anad D. F. Strobel

THE AERONOMY OF ODD NITROGEN IN THE THERMOSPHERE. *J. Geophys. Res., 80(22):3068-3076, Aug. 1, 1975. 66 refs.*

A model for the aeronomy of odd nitrogen in the thermosphere is constructed that satisfactorily describes published measurements of odd N2 species. On the basis of theoretical considerations of the molecular processes associated with N2+ and O equals NO+ and N and N2 dissociation by electron impact and EUD radiation between 800 and 1000 A, it is argued that essentially every reaction of N2+ and O leads to the formation of N(2D) and that the latter processes proceed through the same intermediate states which predissociate to form one N(2D) and one N(4S) atom. The model predicts NO omega (O,O) band emission. (Author abstract modified)

53809 **APTIC NO. 78243**

Osa, Minoru, Shoji Fukuda, Yasuo Hashimoto, and Shigeru Suzuki

ON WIND DIRECTION AND CONCENTRATION OF SULFUR OXIDES AT MOTOYAMA ELEMENTARY SCHOOL IN ASHIO-CHO. *(Ashio-cho Motoyama Shogakko ni okeru io sankabutsu nodo to kazamuki ni tsuite). Text in Japanese. Tochigi-ken Kogai Kenkyusho Nenpo (Annu. Rep. Tochigi Prefect. Res. Inst. Environ. Pollut., no. 1:104-114, Jan. 1975.*

Relationships between wind directions and concentrations of sulfur oxides were investigated at the Motoyama Elementary School, in the town of Ashio, Tochigi Prefecture, Japan, during September 1973-August 1974. Concentrations of SOx were determined automatically and continuously by solvent electrical conductivity methods during that time. Wind directions and velocity were measured from October 1973 to February 1974. The elementary school is located about 1 km south of a mining refinery, and is situated on the west bank of a river, with mountains directly to its west, and across the river to the east. Monthly average values of SOx ranged from 0.017-0.041 ppm. Concentrations of SOx were highest between 8-10 am. About once a week, daily average concentration of SOx exceeded 0.04 ppm. Wind directions were mainly from the southwest (50.6% of the time), or northeast (22.4%). Southerly winds (12.7%) and northerly winds (7.5%) occurred the rest of the time. Southwesterly wind occurred between 4 pm and 8 am of the following day, followed by shift to northeasterly winds about 9 am, 2-3 hr after sunrise. When northeasterly winds of velocities below 2 m/sec occurred, high concentrations of SOx resulted. High concentrations also resulted during a lull in the wind during the morning hours, when wind direction was shifting from southwest to northeast.

53810 **APTIC NO. 75932**

Pasquill, F.

SOME TOPICS RELATING TO MODELLING OF DISPERSION IN BOUNDARY LAYER (SPECIAL REPORT). *North Carolina State Univ., Raleigh, Environmental Protection Agency Research Grant 800662, Program Element 1AA009, ROAP 21ADO, Rept. EPA-650/4-75-015, 66p., April 1975. 12 refs.*

NTIS: PB 243524/AS

A review of six topics dealing with the modeling of dispersion in the atmospheric boundary layer is presented. The topics are: the second-order closure modeling of turbulence, crosswind dispersion and the properties of turbulence, wind direction fluctuation statistics over long sampling times, local similarity treatment of vertical spread from a ground source, representations of dispersion in terms of distance or time, and modeling for elevated sources. (Author abstract modified)

53811 **APTIC NO. 78175**

Peel, D. A.

ORGANOCHLORINE RESIDUES IN ANTARCTIC SNOW. *Nature (London), 254(5498):324-325, March 27, 1975. 14 refs.*

Levels of DDT and metabolites in Antarctic snow are reported which suggest that the role of the atmosphere in the transport of DDT is overemphasized. The total concentration of DDT and its metabolites range from 0.1 to 2.0 times 10 to the -12th power g/g; however, pp prime DDE is consistently more abundant than pp prime DDT by a factor of 1.3 to 1.8. There is no evidence for families of other components corresponding to polychlorobiphenyls in the 50-60% chlorine composition range. The DDE/DDT ratio point to further photodegradation of DDT vapor in sunlight during atmospheric transport. The Antarctic environment is much more strongly shielded from penetration by polychlorobiphenyls than by DDT-r. This argues against the idea, that on a global scale the atmosphere is the predominant mode of transport for polychlorobiphenyls.

53812 **APTIC NO. 77776**

Peters, L. K.

ON THE CRITERIA FOR THE OCCURRENCE OF FUMIGATION INLAND FROM A LARGE LAKE. *Atmos. Environ., 9(9):809-816, Sept. 1975. 8 refs.*

Analytical models based on a boundary layer method and a constant heat flux method are developed to quantify the region in which fumigation inland from a large lake occurs. Conditions for such occurrences are possible when stratified air over a large body of water flows across a warmer land surface. This type of fumigation can persist for hours at a time. The models predict slightly different results, but both models show that fumigation does not always occur. The criterion for the occurrence of fumigation is based on the potential temperature gradient, the effective source height, and the difference in temperature between the land and the lake. Comparison of the models with the extremely limited field data available at this time is reasonably good. (Author abstract modified)

53813 **APTIC NO. 78328**

Plass, Gilbert N., George W. Kattawar, and John A. Guinn, Jr.

RADIATIVE TRANSFER IN THE EARTH S ATMOSPHERE AND OCEAN: INFLUENCE OF OCEAN WAVES. *Appl. Opt., 14(8):1924-1936, Aug. 1975. 14 refs.*

The radiance in the earth s atmosphere and ocean is calculated for a realistic model including an ocean surface with waves. Individual photons are followed in a Monte Carlo calculation. Both Rayleigh scattering by the molecules and Mie scattering by the aerosols as well as molecular and aerosol absorption are taken into account. Separate single scattering functions are used which are calculated separately for the aerosols and the hydrosols from the Mie theory with appropriate and different size distributions in each case. The scattering angles are determined from the appropriate scattering function including the strong forward scattering peak when there is aerosol or hydrosol scattering. The radiance changes are sufficient at the top of the atmosphere to determine the sea state from satellite measurements. Within the ocean the waves smooth out the abrupt transition that occurs at the edge of the allowed cone for radiation entering a calm ocean. The influence of the waves on the contrast between the sky and sea at the horizon is discussed. (Author abstract modified)

53814 **APTIC NO. 77870**

Price, James H., Gary K. Tannahill, James P. Gise, and Roger R. Wallis

ESTIMATION OF MINIMUM ACHIEVABLE OXIDANT LEVELS BY TRAJECTORY ANALYSIS: IMPLICATIONS FOR OXIDANT CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-07.2.)*

Air trajectory analysis using wind data is discussed in relation to determining the minimum achievable oxidant levels for an area. The analysis can be used to specifically determine whether non- urban ozone is capable of preventing the attainment of air quality standards in an area with some local sources of ozone or its precursors. Application of the technique to the Austin, Texas area reveals that background ozone levels in Texas approach or exceed the ambient air quality standard for photochemical oxidants. Current control strategies are not designed to abate these ozone levels, and it is unlikely that the application of available controls to the city or the entire air quality control region will result in ozone levels less than 0.81 ppm.

53815 **APTIC NO. 78003**

Reed, Edith I. and Sushil Chandra

THE GLOBAL CHARACTERISTICS OF ATMOSPHERIC EMISSIONS IN THE LOWER THERMOSPHERE AND THEIR AERONOMIC IMPLICATIONS. *J. Geophys. Res., 80(22):3053-3062, Aug. 1, 1975. 33 refs.*

The green line (557.7 nm) of atomic oxygen and the Herzberg bands of molecular O2 (measured between 250 and 280 nm) as observed from the Ogo 4 airglow photometer from Aug. 1967 through Jan. 1968 are discussed in terms of their spatial and temporal distributions and their relation to the atomic O content in the lower thermosphere. Daily maps of the distribution of emissions show considerable structure with appreciable changes from day to day. The seasonal variation is characterized by maxima in both the northern and the southern hemispheres in Oct., the northern hemisphere having substantially higher emission rates. These maximuma tend to move toward the poles, leaving very low values of emission at low latitudes in Dec. and Jan. Formulae are derived relating the vertical column emission rates of the green line and the Herzberg bands to the atomic oxygen peak density. (Author abstract modified)

53816 **APTIC NO. 77754**

Reiter, Elmar R.

STRATOSPHERIC-TROPOSPHERIC EXCHANGE PROCESSES. *Rev. Geophys. Space Physics, 13(4):459-474, Aug. 1975. 56 refs.*

Qualitative descriptions and quantitative estimates are presented of various transport processes between stratosphere and troposphere. The seasonal changes of tropopause heights account for a flux of about 10% of the mass of the stratosphere in one hemisphere during the course of 1 yr. This flux is balanced approximately by the seasonal shift of stratospheric air masses between the northern and southern hemispheres. Vertical transport through the Hadley cell transfers approximately 38% of the mass equivalent to one hemispheric stratosphere through the tropopause per year. This is the most effective of all transport mechanisms. Large scale eddies of the scale of cyclones and anticyclones transfer about 20% of stratospheric air through the tropopause per year. Small scale and mesoscale diffusion processes at tropopause level probably account for the transfer of only 1% of stratospheric air. These mass flux estimates are in reasonable agreement with observed residence times of stratospheric pollutants. (Author abstract modified)

53817 **APTIC NO. 77955**

Roffman, A. and R. K. Rao

APPLICATION OF A THREE DIMENSIONAL DIFFUSION MODEL FOR PREDICTING AIR POLLUTION UNDER THERMAL INVERSION BREAKUP FUMIGATION CONDITIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975. Paper 75-04.1.)*

A three dimensional numerical model for the transport and diffusion of air pollutants from an elevated continuous point source in the earth s boundary layer is described. The flow field is specified by the heights of surface and mixing layers, the vertical wind profiles in these layers, the stability parameter, and the roughness length. The emission rate of the source and the plume rise are also input for the model. The effect of terrain is taken into account by superimposing empirical perturbations on the wind fields. The model is applied to a thermal inversion breakup fumigation situation observed near an electrical generating complex. Vertical temperature profiles obtained from helicopter soundings and wind data obtained by pilot balloon observations are utilized for computing wind profiles and stability parameters which are input into the model for dispersion calculations. Sulfur dioxide concentrations predicted by the model correspond fairly well to observed values at the plume centerline as well as near the ground during the inversion breakup period. Calculated centerline concentrations of SO2 are in good agreement with the measured values when terrain features are considered. (Author abstract modified)

53818 **APTIC NO. 77924**

Rowe, Richard D.

FATE OF SO2 IN THE ATMOSPHERE FROM SOUR GAS PLANTS. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 58-63. 15 refs. (Jan. 16-17.)*

An outline is given of the objectives and research plans of a project to study the effluent from sour gas plants. A major objective of this project is to produce a mass balance for the sulfur that is emitted into the atmosphere from sour gas plants in various localities in Alberta. Small-scale and meso-scale control volumes will be examined to produce sulfur budgets. Recent progress in studying atmospheric sulfur dioxide is discussed. Data on the pH and sulfate content of rainfall, snowfall, particulates, soils, grasses, and barks in Alberta is expected to be useful in the project. Field experiments to study chemical transformations within sulfur plant plumes for downwind distances out to about 100 km are planned for 1975. Consideration is being given to the injection into the stack gases of a chemically inert tracer, so that the rate of transformation of SO2 can be determined directly. High volume particulate sampling for both classification and size range is under study and suitable adaptations will be developed to be incorporated with the air sampler used to determine stable sulfur isotope ratios in field trials. Plume rise as a function of heat emission rate will also be investigated during these surveys both with airborne instrumentation and with ultraviolet photography.

53819 **APTIC NO. 77839**

Schere, Kenneth L. and Dennis W. Thomson

VERTICAL PROFILES AND SIZE DISTRIBUTIONS OF PARTICULATES OVER ST. LOUIS, MISSOURI. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1975. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-58.3.)*

Vertical profiles and size distributions of the aerosol burden upwind, over, and downwind of the St. Louis metropolitan area were studied concurrently with the 1973-1974 Regional Air Pollution Study. A marked homogeneity is evident in particulate number density within the mixed layer, especially during afternoon hours. Although this feature is present in air masses of differing origin, the magnitude of the particulate number concentration is observed to differ by more than an order of magnitude from one air mass to another. Many individual profiles exhibit the masking influence of near-by anthropogenic sources on the normal dispersion patterns. Airborne estimates of the size distributions of the aerosols are also obtained. The effects of the changing proportions of large and small particles on the size spectra affect the slope of the size distribution. Representative size distributions are presented in power law form for each of two distinct air masses and altitudes. (Author abstract modified)

53820 **APTIC NO. 77996**

Sehmel, George A.

EXPERIMENTAL MEASUREMENTS AND PREDICTIONS OF PARTICLE DEPOSITION AND RESUSPENSION RATES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-25.2.)*

Results from experiments investigating particle deposition and resuspension rates are reported. Deposition studies were conducted with a wind tunnel in which monodisperse aerosols were allowed to deposit on a variety of surfaces. Various wind speeds were employed; and data obtained for the deposition velocities were correlated with particle size, surface roughness, and wind speed. Deposition velocities varied over several orders of magnitude from 0.001 to 10 cm/sec. The actual value was dependent on particle diameter, particle density, surface roughness, and wind speed and reflected the relative contribution to mass transfer of Brownian diffusion, eddy diffusion, and gravity settling. Deposition velocities were also a function of atmospheric stability, but the dependence was relatively minor. Deposition velocities in all cases were greater than those predicted by simple gravity settling rates. Experiments in which submicron preformed aerosol was seeded onto a plot of ground revealed resuspension rates ranging from 2 times 10 to the -10 fraction resuspended per second for 1.3 m/sec winds to 2 times 10 to the -8 fraction per second for 5.8 m/sec winds. (Author abstract modified)

53821 **APTIC NO. 77946**

Severs, Richard K. and Jack C. Peng

CHARACTERIZATION OF AMBIENT AEROSOLS BY SEVEN CHANNEL SOLAR RADIOMETRY AND OTHER MEASUREMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-28.5.)*

The relationship between ambient air quality measurements and those of solar flux extinction due to light scattering by aerosols was investigated. Extinction coefficients were calculated based on optical depths, scattering coefficients were calculated postulating the Jung distribution, and the mass distribution was fitted to a linear model by regression. The relationship between parameters was investigated by correlation techniques. Total mass was calculated from numbers of particles in each size range assuming uniform density and spherical shape. Ground particulate loading has a correlation of r equals 0.91 with a logarithmic vertical distribution under the 9:00 mixing height and columnar mass based on the aerosol size diameter, 2ro, figured from the optical depth profile multiplied by the number of aerosols of that diameter based on interpolation of numbers in each size range measured by a forward light scattering photometer. The Anderson Hi-volume sampler data have a high correlation to total suspended particulate mass. Total mass less than 1.0 micron has a correlation coefficient r equals 0.43 with nephelometry data for number of particles less than 1.0 micron in diameter. (Author abstract modified)

53822 **APTIC NO. 77738**

Shiozawa, Kiyoshige, Shin ichi Okamoto, and Atsushi Ootaki

STATISTICAL PREDICTION MODELING FOR REGIONAL AIR POLLUTION PREVENTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-53.4.)*

Statistical simultaneous estimation procedures of the concentration of continuous monitoring networks are developed in the air pollution control district for the daily activities in the regional air pollution prevention. The statistical variations of the concentration having the periodical property along with the autoregressive property are presented followed by the applicable statistical estimation procedures. The ordinary regression analysis is applied in the frequency domains. The procedures are applied to the estimation of sulfur oxides concentrations. The predicted values according to these models agree considerably well with the measured values. (Author abstract modified)

53823 **APTIC NO. 77739**

Sklarew, Ralph C., John C. Wilson, and Allan J. Fabrick

AIR QUALITY MAINTENANCE THROUGH PRACTICAL MODELING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-53.7.)*

The maintenance of acceptable air quality levels during future growth requires models relating planned industrial highway and area land use changes to ambient pollutant levels. A two step process is required to convert the planned activity into emissions and then convert emissions to ambient air quality. Emission factors are developed by Environmental Protection Agency for industrial processes and traffic but land use based emission factors are not available. A simple methodology was developed to calculate area specific land use based emission factors. The conversion of emissions into air quality requires a whole spectrum of dispersion models. Practical applications of proportional, Gaussian, and grid models are described for general land use planning, complex sources, power plants, and highways. (Author abstract modified)

53824 **APTIC NO. 77991**

Smith, Douglas G.

INFLUENCE OF METEOROLOGICAL FACTORS UPON EFFLUENT CONCENTRATIONS ON AND NEAR BUILDINGS WITH SHORT STACKS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1975. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-26.2.)*

Continuous photometric measurements of a visible 0.7-micron dioctyl phthalate aerosol tracer were made on the roof and walls, and within 10 m downwind, of a 3 m by 3 m by 2 m high model of an industrial building to investigate the effects of a variety of common meteorological conditions on the pollutant concentrations that occur in the near wake of a source building having a short stack. Dimensionless wake cavity concentrations were correlated with measurements of wind speed and direction, turbulence intensity, the gradient Richardson number, and the aerodynamic roughness height of the upwind fetch. Stack heights ranged from flush exhaust vents to heights more than twice that of the building. Only neutrally buoyant plumes were investigated. There was a strong relationship between wall and roof concentrations and stack height, with significantly lower pollutant concentrations occurring for even modest increases in stack height ratio. A 10% change in stack height ratio produced about a 33% change in downwind wake cavity concentrations under neutral to stable atmospheric conditions. A comparison of the results with wind tunnel studies of a cubical model on a smooth surface revealed generally good agreement. Field test results, however, suggested that the rate of improvement predicted from wind tunnel results may be overly optimistic unless careful attention is given to the simulation of atmospheric turbulence and aerodynamic roughness of upwind surfaces. (Author abstract modified)

53825 **APTIC NO. 78120**

Stedman, D. H. and J. O. Jackson

THE PHOTOSTATIONARY STATE IN PHOTOCHEMICAL SMOG. *Intern. J. Chem. Kinet., vol. 1975:493-501, 1975. 15 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

A photostationary state equation for the photolysis of nitrogen dioxide by ultraviolet light was tested with ambient air measurements obtained in downtown Detroit in the summer of 1973. The equation stated that the concentration of NO2 times the rate constant for the dissociation of NO2 into nitric oxide and atomic oxygen can be divided by the rate constant for the reaction of NO with ozone (which produces NO2 and O2) times the concentrations of ozone and NO to yield a numerical value of 1. An experimental value of 1.01 was obtained during actual smog conditions from 400 data sets with a standard deviation of 0.2 and a standard error of 0.01, representing a verification of the equation. (Author abstract modified)

53826 **APTIC NO. 78182**

Steinberger, E. H. and Y. Balmor

SULPHUR DIOXIDE IN THE ATMOSPHERE IN JERUSALEM AND THE ROLE OF METEOROLOGY ON POLLUTANT CONCENTRATIONS IN SUBTROPICAL REGIONS. *Atmos. Environ., 9(4):409-416, April 1975. 17 refs.*

Sulfur dioxide concentrations were determined in Jerusalem during 1973 both for the winter and summer months. The seasonal and diurnal variation (in the summer) are different from those found in temperate regions. This difference is partly caused by the source distribution pattern and partly by the climatic and meteorological conditions determining pollutant dispersion. There are significant correlations between daily average SO2 concentration and rainfall only in the winter, while in the summer temperature and mixing depth correlate with SO2. Neither wind speed nor wind direction in the summer influenced the ambient SO2 concentrations. (Author abstract modified)

53827 **APTIC NO. 78256**

Suzuki, S.

ATMOSPHERIC CHEMICAL REACTIONS. (NO. 3): SULFUR DIOXIDE. *(Taiki kagaku hanno (Dai 3 kai): Aryusan gasu). Text in Japanese. Sekiyu Gakkaishi (J. Japan Petroleum Inst. (Tokyo), 18(5):408-419, May 1975. 130 refs.*

Atmospheric chemical reactions of sulfur dioxide are reviewed, including the photo-excitation and deactivation of SO2, the reaction of triplet SO2 (formation of singlet oxygen), reaction of triplet SO2 and hydrocarbons (hydrogen addition and subtraction reactions, formation of organic compounds containing O2 and organic compounds containing sulfur), and oxidation reactions of SO2 (formation of sulfuric acid or sulfate from SO2). As for the effect of SO2 on the environment, the interaction between air pollutants and the environment, the deposition of pollutants on the ground and the deposition velocity, absorption of SO2 by rivers and oceans, and rainout and washout mechanisms are discussed. The reaction of SO2 in the stratosphere (formation of the sulfate layer) is also reviewed.

53828 **APTIC NO. 77689**

Tiao, G. C., M. S. Phadke, and G. E. P. Box

SOME EMPIRICAL MODELS FOR THE LOS ANGELES PHOTOCHEMICAL SMOG DATA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-51.5.)*

Empirical models were developed for the Los Angeles photochemical smog data. An empirico-mechanistic model was derived which describes the dependence of carbon monoxide, nitric oxide, nitrogen dioxide, and ozone on total hydrocarbons, traffic, wind speed, inversion base height, and solar radiation as well as the photochemical reactions associated with these pollutants. Weather conditions were investigated when the instantaneous daily maximum O3 exceeds the Los Angeles alert level of 50 pphm. Exceedances occur most frequently at Pasadena and Azusa and the average time of occurrence is 1 to 1.5 hr later than that at downtown Los Angeles. This is expected because the prevailing daytime wind is from the south west direction, and these two locations are at the end of the reactor pipeline. Regression models were developed for the prediction of daily maximum O3 values based on daily data from July-Oct. 1970. (Author abstract modified)

53829 **APTIC NO. 78016**

Tomasi, Claudio, Rodolfo Guzzi, and Ottavio Vittori

THE SO2-NH3-SOLUTION DROPLETS SYSTEM IN AN URBAN ATMOSPHERE. *J. Atmospheric Sci., 32(8):1580-1586, Aug. 1975. 12 refs.*

The transformation of airborne sulfur dioxide to sulfate was studied in a polluted urban atmosphere by investigating the equilibrium of the system consisting of SO2, liquid water, and ammonia. There were 10 classes of atmospheric liquid water content set up based on the average spectra of airborne particulate matter and local visibilities. The investigation covered 174 selected days. The SO2 concentration fell drastically during the summer, confirming that the main source of this contaminant in urban areas was domestic heating. The NH3 concentration showed that exact opposite trend, supporting the hypothesis that soil bacteria activity was an important source of this gas. The SO2-H2O-NH3 system satisfactorily fitted the Junge and Ryan laboratory model. An observed seasonal trend in the yield of sulfate resulting from the transformation of SO2 appeared to be due to seasonal changes in the catalytic activity of airborne pollutants and the efficiency of scavenging mechanisms which included airborne particles in water droplets. The pH of the liquid water droplets, as computed on the basis of SO2 concentration, agreed fairly well with the pH measured during urban haze and fog. (Author abstract modified)

53830 **APTIC NO. 77938**

Vaughan, W. M., R. B. Sperling, N. V. Gillani, and R. B. Husar

HORIZONTAL SO2 MASS FLOW RATE MEASUREMENTS IN PLUMES: A COMPARISON OF CORRELATION SPECTROMETER DATA WITH A DISPERSION AND REMOVAL MODEL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-17.2.)*

A Barringer correlation spectrometer was used to make remote measurements of the total overhead sulfur dioxide burden (g/sq m) in large plumes over the St. Louis area. The correlation spectrometer was operated in a mobile laboratory which was also equipped with a flame photometric sulfur analyzer and a data recorder. Data were gathered on August 3, 1974 when westerly wind conditions prevailed. Mapping was performed for two separate plumes, one originating from a large petroleum refinery complex (low level source) and the other from a power plant (elevated source). The spectrometer measurements from transverses perpendicular to the plume axis and wind velocity measurements from pibals were used to estimate the horizontal SO2 mass flow rates at three distances downwind of each source. Substantial and systematic decreases in SO2 mass flow rate were observed with increasing distance from the source, indicating surface removal of the pollutant from the plume. The experimental results were compared with those of a diffusion model of pollutant dispersion with surface removal in order to estimate strength of the surface sink expressed in terms of deposition velocity. The inferred value of the deposition velocity of SO2 was in agreement with that estimated from previous independent measurements in the St. Louis region under comparable meteorological conditions. (Author abstract modified)

53831 APTIC NO. 78104

Wang, Charles C., L. I. Davis, Jr., C. H. Wu, S. Japar, H. Niki, and B. Weinstock

HYDROXYL RADICAL CONCENTRATIONS MEASURED IN AMBIENT AIR. *Science, 189(4205):797-800, Sept. 5, 1975. 29 refs.*

Diurnal variations in the hydroxyl radical concentration of ambient air were measured by the technique of laser-induced fluorescence. The HO concentration builds up in the morning, peaks in the afternoon, and decreases to below the detection limit at night. The peak HO concentration also varies from day to day; it reaches a level in excess of 10 to the 7th power molecules/cu cm on sunny summer days but is below the detection limit on rainy or cloudy days. In addition the processes operative in the natural troposphere that produce HO, direct production of HO through photodissociation of atmospheric contaminants such as nitrous acid may also play an important role in determining the HO concentration. (Author abstract modified)

53832 APTIC NO. 77651

Wang, I. T., D. M. Rote, and L. A. Conley

ANALYSIS OF AIR POLLUTION IMPACT AT WASHINGTON NATIONAL AIRPORT USING DISPERSION MODELS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1975. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-53.5.)*

The application of a practical dispersion modeling package for airport air pollution impact assessments is described. The model is used to evaluate the air quality impact of airport operations at Washington National Airport. Isopleths of air pollutant concentrations are generated for a variety of combinations of aircraft activity levels and meteolorogical conditions. These displays are then used for comparison with the Federal Air Quality Standard, where applicable. The impact of aircraft activity under both average and worse case meteorological conditions on populated areas adjacent to the airport itself is investigated. The pollutant concentrations coming from airport related sources over populated areas adjacent to the airport are low compared to the Federal Air Quality Standard, even under worst case conditions. Ground level concentrations due to aircraft airborne operations are insignificant. In certain areas in the airport, especially near start ends of busy runways, the 8-hour carbon monoxide standards are exceeded under adverse meteorological conditions. (Author abstract modified)

53833 APTIC NO. 77832

Weitzman, Leo, John C. Reed, and Charles E. Dare

SIMPLIFIED CALCULATION PROCEDURES FOR PREDICTING CARBON MONOXIDE DUE TO VEHICULAR TRAFFIC. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1975. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-44.2.)*

A simplified calculation procedure for predicting carbon monoxide concentrations due to vehicular traffic is presented. The prediction method requires only a small inexpensive programmable calculator. The dispersion calculations are similar to those of the Environmental Protection Agency HIWAY program but uses a simple finite increment summation up the lane rather than a trapezoidal rule integration scheme. The program represents the road as a series of point sources, and the sum of the pollutant contributions from these is the overall CO concentration at the receptor. The calculation is initially performed using 20-meter segments and is then repeated with the segment lengths halved for successive summations until the pollutant concentration calculated by two consecutive summation differs by less than 1%. This algorithm is repeated for each lane, and the sum of the contributions from all the lanes is the pollutant concentration due to the road. The program requires 671 steps, excluding those required for data storage. The results of the program are within 2.5% of those obtained with the HIWAY program.

53834 APTIC NO. 77968

Whelpdale, D. M. and P. W. Summers

THE ROLE OF THE ATMOSPERHIC ENVIRONMENT SERVICE, ENVIRONMENT CANADA IN STUDIES OF ATMOSPHERIC SULPHUR COMPOUNDS. *Alberta Environment, Edmonton (Canada) Research Secretariat and University of Calgary, Calgary (Canada) Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II, Proc. Kananaskis, Canada, 1975, p. 1-19. 12 refs. (Jan. 16-17.)*

The organization of the Atmospheric Environment Service (AES) is briefly described. The AES is responsible for Canada s participation in the World Meteorological Organization s network of air pollution monitoring stations. There are 8 stations in Canada. The tallest stack (380m) and the largest point source emission of sulfur dioxide in the world is at Sudbury, Canada. Field observation programs have been carried out there to study the characteristics of the plume rise and dispersion and to determine precipitation scavenging rates. The SO2 oxidation rates were low, indicating that measured decreases in SO2 concentration during the first hundred or so km of plume travel are primarily a result of atmospheric dispersion. Projects in several localities studied sulfur sinks including storms, precipitation, and direct uptake by water, grass, and snow surfaces. Residence times and scavenging rates were also studied. Canada, represented by AES, has been participating as an observer in a project underway to investigate the long-range transport of pollutants, primarily sulfur compounds, in Western Europe. Several Canadian locations are discussed where large emissions of SO2 make the investigation of this problem desirable. Projects are in progress to determine the effect of air pollution on lichens in the Saint John, New Brunswick region and in the Mackenzie Valley. The conceptual approach to the modelling work at AES is described. The overall approach used in the development of the complete model package is to make it as flexible as possible by modularizing the various processes.

53835 APTIC NO. 77848

White, Warren H. and Paul T. Roberts

THE NATURE AND ORIGINS OF VISIBILITY REDUCING AEROSOLS IN LOS ANGELES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-28.6.)*

The relationship between emissions of reactive gases and deterioration of visibility is discussed base on statistical interpretation of data from the California Aerosol Characterization Study. Atmospheric visibility is reduced by the presence of light scattering aerosols. Sulfate and nitrate compounds scatter more efficiently than other aerosol components. The likely source of most particulate sulfate and nitrate is the oxidation of sulfur dioxide and nitrogen oxides in the atmosphere. The qualitative accuracy of existing inventories for these gases is verified by multiple regression of ambient SO2 and NOx concentrations on the concentrations of chemical tracers for the fossil fuels. Gasoline and oil based sources are of comparable importance in reducing visibility, together accounting for about two-thirds of the light scattering observed. (Author abstract modified)

53836 **APTIC NO. 77895**

Wilson, A. L., R. F. Kosky, and F. L. Cross, Jr.

SELECTION, APPLICATION AND PRACTICAL PROBLEMS OF AIR POLLUTION ENVIRONMENTAL ASSESSMENT WITH MATHEMATICAL MODELS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-63.3.)*

Information is provided on the selection of an atmospheric dispersion model. Most mathematical urban air pollution models currently in use are comprised of four essential components: meteorological algorithm, emission inventory, meteorological data and air qaulity data. These four components are interdependent in the selection and application of the model and the accuracy and/or completeness of these components determine the degree of temporal and spatial resolution. Selection of the model has three general steps: determination of the spatial and temporal resolution desired, listing of the models that will meet the requirements and determination of the available data. A case study for sulfur dioxide in Tampa, Florida is presented. The Air Quality Display Model was utilized for the long term impact. A calibration factor of 0.12 for 1972 was determined using ambient air quality data from 18 stations. Short term impact (3 hr and 24 hr) was determined using two Environmental Protection Agency models and the Tennessee Valley Authority s inversion break-up and trapping models. Since these models have not been statistically calibrated for the Tampa Bay area, only general conclusions could be made. (Author abstract modified)

53837 **APTIC NO. 78159**

Winstanley, J. V. and M. J. Adams

POINT VISIBILITY METER: A FORWARD SCATTER INSTRUMENT FOR THE MEASUREMENT OF AEROSOL EXTINCTION COEFFICIENT. *Appl. Opt., 14(9):2151-2157, Sept. 1975. 24 refs.*

A new instrument for the measurement of atmospheric extinction coefficient--the Point Visibility Meter (PVM) is introduced and its principle of operation discussed. The instrument measures the amount of light scattered at a particular forward scattering angle by haze or fog; the extinction coefficient is then found from the empirical law relating to the scatter at this angle. Detailed calculations of aerosol scattering properties using Mie theory are given to support this empirical law. Error estimates based on these calculations indicate rms errors of less than + or - 12% for a range of values 2-60/km. Field trials of the instrument against standard transmissometers confirm these theoretical findings and show a linearity of instrumental output with extinction coefficient, with an rms error of + or - 11.7%. (Author abstract)

53838 **APTIC NO. 77697**

Wolff, George T., William N. Stasiuk, Jr., Peter E. Coffey, and Ralph E. Pasceri

AERIAL OZONE MEASUREMENTS OVER NEW JERSEY, NEW YORK, AND CONNECTICUT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-58.6.)*

Aerial ozone surveys were made over the New Jersey, New York, and Connecticut areas to determine the background O3 levels transported into the tri-state area and the amount generated within the area. On the two days surveyed, the air mass entering the area contained background O3 levels already exceeding the Federal standard of 0.08 ppm by 10-30%. Vertical and horizontal profiles performed downwind of the Philadelphia- Camden areas and downwind of the Northeastern New Jersey and New York City area show that the O3 levels increase 30-40% over the background level. Local nitric acid emissions in the vicinity of urban monitors result in low O3 values which may not be representative of the neighboring areas. (Author abstract modified)

53839 **APTIC NO. 78001**

Wu, Benjamin J. C.

POSSIBLE WATER VAPOR CONDENSATION IN ROCKET EXHAUST PLUMES. *AIAA (Am. Inst. Aeron. Astronaut. J.), 13(6):797-802, June 1975. 46 refs.*

The onset of water vapor condensation in plumes induced by homogeneous nucleation is calculated. The steady state nucleation theory is assumed for nonisothermal cluster growth and empirical information from studies at higher temperatures and pressures is used. Water condensation takes place about 45 m downstream of the nozzle exit plane in the center stream tube at a temperature of 170 K. Calculations of the condensation process beyond the onset point, using the stream tube area distribution of noncondensing flow leads to an estimate of the droplet size distribution. It is estimated that x equals 150 m in the center stream tube, about 10 to the 10th power droplets/cu cm are formed by homogeneous nucleation. The mass mean radius of this cloud of droplets is about 17 A. (Author summary modified)

53840 **APTIC NO. 78039**

GENERAL DISCUSSION SESSION III. *Intern. J. Chem. Kinet., vol. 1975:353-358, 1975. 4 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Topics in chemical kinetics are discussed, with particular emphasis on components that interact in the lower and middle atmosphere. Topics covered include: Uncertainties in Arrhenius expression parameters, the reliability of rate constant data, the selection of reactive channels in hydroxyl radical-olefin reactions for photochemical smog modeling, and the role of abstraction in OH-olefin reactions.

53841 **APTIC NO. 78040**

GENERAL DISCUSSION SESSION II. *Intern. J. Chem. Kinet., vol. 1975:235-247, 1975. 20 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Topics in chemical kinetics are discussed, with particular reference to the interaction of pollutants in the lower and middle atmosphere. Topics covered include: the production of organic acids as a result of the photooxidation of olefins, models for predicting smog component concentrations, the Los Angeles oxidant control strategy, the effect of nitrogen oxide concentration variation on ozone production, ozone-olefin reactions, hydroxyl radical-olefin reactions, the reliability of rate constant data, discrepancies between ozone calibration procedures for oxidant monitors, reactions of heavy hydrocarbons in flow tubes, and reactions between sulfhydryl radicals and ozone which produce excited species.

53842 **APTIC NO. 78041**

GENERAL DISCUSSION SESSION IV. *Intern. J. Chem. Kinet., vol. 1975:503-508, 1975. 8 refs. Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Various topics in chemical kinetics are discussed, with particular reference to the interaction of pollutants in the lower and middle atmosphere. Topics covered include: problems involved with transition state theory and modifications of it, chemical bond making and breaking, the non-Arrhenius behavior of rate constants over a given temperature range, the effect of sulfur dioxide addition to a smog system (hydrocarbons, nitrogen oxides, and air) on ozone production, the reaction between hydroxyl radical and SO2, the role of excited nitrogen dioxide states in the achievement of the photostationary state, the reaction of NO2 with O3, correlations between changes in source functions such as rush hour traffic peaks with variations from unity in the photostationary state ratio, and the significance of ammonia oxidation in terms of tropospheric and stratospheric chemistry.

1974

53843 **APTIC NO. 78029**

Andreyev, S. D., L. S. Ivlev, and A. V. Poberovskiy

AEROSOL ATTENUATION OF RADIATION IN THE 8-13 MICRON ATMOSPHERIC WINDOW. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk, SSSR, Fiz. Atmosfery i Okeana), 10(10:680-682, Oct. 1974. 15 refs. ABSTRACT*

Aerosol attenuation of infrared radiation in the 8-13 micron portion of the spectrum is discussed. Laboratory studies indicate that isolated fractions of atmospheric aerosol possess extremely strong absorption bands in the infrared region, and model calculations of the complex refractive index of aerosols in the 0.3-15 micron portion of the spectrum confirm this conclusion. Data are presented showing that the aerosol attenuation maximum is located near 9.2 micron; the long wavelength wing is partially overlapped by an ozone absorption band centered at 9.6 micron. Aerosol attenuation in the 8-13 micron region is dependent on relative humidity, with attenuation coefficient decreasing when the humidity increases. The observed dependence of aerosol attenuation coefficients on humidity must be taken into account in the interpretation of measurements made on slant paths. The influence of this effect and of other mechanisms that relate aerosol attenuation to humidity, as well as a possible nonlinearity in water vapor absorption, complicate the application of existing methods of separating the attenuation components and lead to an indeterminacy in the aerosol attenuation values obtained.

53844 **APTIC NO. 77900**

Brewer, A. W. and C. T. McElroy

SPECTROPHOTOMETRIC NITROGEN DIOXIDE MEASUREMENTS. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 257-263, 4 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

Atmospheric nitrogen dioxide was measured using its absorption spectrum at visible and near-ultraviolet wavelengths with a photo-counting spectrophotometer. A mathematical function is given which reduces many extraneous effects. The exponential growth of absorption was confirmed and the effective absorption coefficient determined. Zenith sky and direct sun measurements were made from the ground at sunrise and sunset under clear air conditions. Direct sun and zenith sky measurements together make it possible to measure the NO2 below the scattering level. The NO2 amount is subject to strong diurnal variation. Except perhaps when the solar zenith angle is 96 deg, no umkehr was found. There is considerably more NO2 in the upper atmosphere during the daytime, and more is seen at sunset than at sunrise. The value of the mathematical function is determined when the secant of the sun's zenith angle equals zero by extrapolating from data obtained near sunrise and sunset. This value is used to calculate the total NO2 overhead at noon, 3 or 4 times 10 to the -3 power atm cm. Nitrogen dioxide concentrations were also measured from a supersonic aircraft. Little seasonal variation in the NO2 was observed above 15 km. The difference between sunrise and sunset mainly occurs in the levels at and below 100 mb. The regions where the difference between morning and evening NO2 concentrations is large are those where the ozone concentration is low. The NO2 may be removed at night by reaction with ozone.

53845 **APTIC NO. 77906**

Fabian, P. and W. F. Libby

THE STRATOSPHERIC RESIDENCE TIME OF ODD NITROGEN AND THE EFFECT OF THE SST, STUDIED IN A TWO-DIMENSIONAL MODEL DERIVED FROM HIGH-ALTITUDE SAMPLING OF RADIOACTIVE DEBRIS. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 103-116, 21 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

A two dimensional time dependent stratospheric model for tracer studies was developed. Various sets of data on eddy diffusion coefficients, and on mean meridional and vertical velocities available from the literature, were introduced in turn while the model was tested against the stratospheric distribution of radioactive debris from high yield nuclear explosions on both hemispheres. The model which yielded the best fits of prediction of sampling data was used to assess the effect of a fleet of supersonic transports on the stratospheric distribution of odd nitrogen, and to estimate residence times. Perturbations were studied for four flight altitudes between 18 km and 24 km for two extreme cases, 500 SSTs equally distributed on the northern hemisphere north of 25 degrees north and 500 SSTs cruising within a latitude belt 10 degrees wide around 40 degrees north. The stratospheric residence time of odd nitrogen was estimated to be 1.5 yr, 1.8 yr, 2.0 yr, and 2.3 yr at 18 km, 20 km, 22 km, and 24 km altitude, respectively. (Author abstract)

53846 **APTIC NO. 77904**

Hofmann, D. J., J. M. Rosen, and T. J. Pepin

GLOBAL MEASUREMENTS OF THE TIME VARIATIONS AND MORPHOLOGY OF THE STRATOSPHERIC AEROSOL. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 284-297, 8 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

The results of over 70 balloon soundings, made over the past 2 yr from 10 stations situated in latitude from 85 deg north to 90 deg south, are utilized in a study of tne time variations and spatial distribution of the global stratospheric aerosol. A simple seasonal variation below 20 km altitude is observed at northern midlatitudes; it results in a maximum total aerosol loading in winter and a minimum in summer. A strong correlation with tropopause height is observed. Asymmetries in the global seasonal variation can be explained in terms of variation of the tropopause height, which affects the stratospheric volume available for aerosol formatin and transport. No seasonal variation is evident above 20 km, and thee natural production processes are almost in equilibrium with loss processes. Thus, the conclusion is drawn that the lifetime of matter injected below about 20 km will be relatively short (annual average of about 6 mo), while above this altitude lifetimes could be considerably longer. Synoptic studies in the northern hemisphere are used to construct latitudinal cross sections of aerosol mixing ratio versus height. These profiles show the variation of the stratospheric aerosol layer with latitute, as well as the existence of other thin layers extending over a very large horizontal distance. Some of these stratospheric layers appear to be associated with transport through the tropopause gap at midlatitudes, while other tropospheric layers appear to be associated with volcanic activity. (Author abstract)

53847 **APTIC NO. 77899**

Johnston, Harold S.

ALTERNATIVE INTERPRETATION OF UMKEHR DATA FOR NITROGEN DIOXIDE. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 264-272, 7 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

The atmospheric nitrogen dioxide column can be measured by observing its visible absorption spectrum. The NO2 column increases by about a factor of 1.5 between early morning and later afternoon. Other parts of the first set of data can be interpreted in two ways. An interpretation is presented in terms of rapidly changing NO2 at sunrise and sunset, a slow smooth increase during the day, and no midday maximum. This is consistent with current chemical models of the stratosphere. (Author abstract modified)

53848 **APTIC NO. 77902**

Kondratyev, K. Y., L. S. Ivlev, and G. A. Nikolsky

INVESTIGATIONS OF THE STRATOSPHERIC AEROSOL. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 143-152, 45 refs.*

NTIS, DDC: AD AO 03846

Experimental investigations of the vertical concentration profile, the size distribution, and the composition of the stratospheric aerosol are reviewed. The effect of aerosol on the radiation regime of the stratosphere is considered. An analysis of the available data leads to conclusions about space/time variations of the structure of the stratospheric aerosol, as well as its optical properties and their influence on the radiation regime of the surface/atmosphere system. (Author abstract modified)

53849 **APTIC NO. 78089**

Mammarella, Luigi

VERTICAL DISTRIBUTION OF URBAN AIR POLLUTION. *(La distribuzione in quota dell inquinamento atmospherico urbano). Text in Italian. Ingegnere (Milan), 49(5):199-215, May 1974. 19 refs.*

A dirigible was used to make quantitative and qualitative samplings of particulate pollution at the ground level of the Rome metropolitan area and at altitudes of 300 and 400 m above ground level. Aerosols were used as the reference pollutant, microbe cultures were made from the air samples and examined microscopically, and results were plotted against ground and aerial readings of temperature, relative humidity, and other meteorological conditions. Four cycles of data were collected, on February 13, 22, and 27 and on March 2, 1973. Meteorological conditions at this time were considered typical for the area during the winter and early spring. Results indicated that at least 60% of the pollutants (and more than two thirds of the products of combustion) were transported upward under the conditions prevailing during the study. Similar plans are envisioned for studies of Turin, Bologna, Genoa, and Naples, in order to confirm the theories tested at Rome.

53850 **APTIC NO. 77901**

Murcray, D. G., A. Goldman, W. J. Williams, F. H. Murcray, J. Van Allen, and S. C. Schmidt

OBSERVATIONS OF THE SOLAR SPECTRUM IN THE 1800-2100 CM-1 REGION AND THE SEARCH FOR NO LINES. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 246-256, 17 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

Observations of the variation with altitude of the infrared solar spectrum between 1800 and 2100 per cm are presented. The spectra were obtained with a balloon-borne grating spectrometer having a spectral resolution of approximately 0.35 per cm. The spectra are interpreted in terms of solar carbon monoxide lines and telluric water vapor, carbon dioxide, and nitrous oxide lines. Contributions from nitric oxide lines are examined. The observed absorptions attributed to NO are overlapped by features due to solar CO and telluric CO2 or N2O, so the quantitative analysis of the results appears uncertain. An upper limit of 1 to 3 ppbv is derived for the mixing ratio of NO in the lower stratosphere. (Author abstract)

53851 **APTIC NO. 77714**

Murphy, Thomas J.

SOURCES OF PHOSPHORUS INPUTS FROM THE ATMOSPHERE AND THEIR SIGNIFICANCE TO OLIGOTROPHIC LAKES. *De Paul Univ., Chicago, Ill., Dept. of Chemistry, Illinois Water Research Center Contract 14-31-0001-4013, Proj. A-065-Ill., Rept. 92, 45p., Sept. 1974. 35 refs.*

NTIS: PB 238 625

Precipitation in the Chicago area was analyzed and found to contain .034 mg/l of phosphorus with about one half of this present as ortho phosphate. This particulate matter, scavenged from the atmosphere by precipitation, can be an important component of the phosphorus budget of natural bodies of water which are low in this essential nutrient. One-fifth to one-third of the phosphorus going into Lake Michigan is from precipitation. The source of this phosphorus was particulate matter containing a relatively consistent 0.1% phosphorus, with the exception of emissions from the fertilizer industry. Programs underway to control particulate emissions in general should reduce the emissions of phosphorus. (Author abstract modified)

53852 **APTIC NO. 78283**

Nakamura, H., H. Inamura and T. Nakamura

AN EVALUATION OF ELECTRIC POWER DEVELOPMENT BY MEANS OF AN INTER-INDUSTRY RELATIONS EVALUATION. *(Sangyo kanren bunseki ni yoru denryoku enerugii kaihatsu no hyoka). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, vol. 4:77-78, 1974. (Presented at the Japan Society of Civil Engineers, Lecture Meeting, 29th, Tokyo, Japan, 1974.)*

The effect of diffusion on industries and control measures which may be introduced when power is to be supplied, by hydraulic, thermal, and atomic energy generators is discussed. Emissions from various industries were estimated at different volumes of power using the inter-industry relations evaluation method, introducing environmental indices per production quantity for each type of industry. The indices included sulfur oxides emissions, fuel consumption, industrial water consumption, and industrial wastes generated. Calculations were based upon the flow of the construction program (power to be generated, construction costs), the cost corrected to the 1965 level, and final expenditures per unit of power. The diffusion effect, at 2,500,000 kW was calculated for three types of power generation. Hydraulic and atomic energy sources were most expensive, followed by thermal power generation. Atomic energy is 10 times superior to thermal power generation with regard to resources and environmental problems.

53853 **APTIC NO. 77908**

Rosenberg, N. W. and E. M. Dewan

STRATOSPHERIC TURBULENCE AND VERTICAL EFFECTIVE DIFFUSION COEFFICIENTS. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 91-101, 32 refs. (Feb. 26-March 1.) NTIS, DDC: AD AO 03846*

An estimate of residence times in the stratosphere in terms of an effective vertical diffusion coefficient was obtained. It was assumed that clear air turbulence (CAT) is the major source of vertical transport, and that almost all CAT is caused by the Kelvin-Helmholtz instability. Velocity data from 200 rocket smoke trail wind profiles at 25 m resolution was used to compute the frequency distribution of the magnitudes of vertical shears of horizontal winds between 5 and 20 km altitude. Analysis of stratospheric shears as a function of altitude from this sample of 30,000 data points revealed that about 2% of the altitude consists of thin sporadic layers of high shear, separated by large regions of low shear. A model for vertical transport by such thin, intermittently occurring turbulent mixing zones, separated by regions of negligible mixing, was generated using the turbulence statistics. It leads to a value of the diffusion coefficient which is approximately 0.3 sq m/s between 12 km and 18 km, when data at 25 m resolution is used. When 100 m resolution is used, the diffusion estimates are slightly smaller. These results agree with results derived from measurements of radioactive fallout and methane loss and seem to indicate that CAT plays a prominent role in vertical transport in the stratosphere. (Author abstract modified)

53854 **APTIC NO. 77713**

Earth Satellite Corp., Washington, D. C. and Booz-Allen Applied Research Corp., Bethesda, Md.

APPLICATIONS FOR ERS MONITORING OF AIR QUALITY. *In: Earth Resources Survey Benefit-Cost Study, App. 6, An Analysis of the Benefits and Costs from the Use of ERS Data in Environmental Analysis (final report). Department of the Interior Contract 14-08-0001-13519. Rept. USGS-DO-75-012, p. 71-75, A-40-43, Nov. 1974.*

NTIS: PB-238-714

The ERTS-1 was used to investigate smoke plumes, atmospheric aerosol content, haze, turbidity, and effects of air pollution on weather. The ability to detect atmospheric pollutants using ERS data is limited because variations in their spectral reflectance due to variations in atmospheric constituents are overwhelmed by variations in the spectral reflectance of the background. However, ERS data appear to be adequate to identify many large emission sources, because a large percentage of such sources emit particulates in addition to the less detectable gaseous chemical pollutants. Plumes from point sources, even in the relatively low emission range, have been readily detected under cloud-free conditions. Area-wide pollution in the form of aerosols can be detected by noting differential reflectance as derived from the various MSS band measurements. This information suffers in accuracy and detail as compared to that from ground based stations. The low spatial and spectral resolution of ERS data and the predictability of observations by satellite limit its use in enforcing emission control regulations. Similarly, although it is possible to detect large plumes and their sources, resolution limits the detection of smaller plumes which are those likely to be missed by current ground based inventory techniques. Determination of regional and global air quality trends may be possible through repetitive coverage and measurement of turbidity and haze. However, because ERS data cannot detect gaseous pollutants or discriminate the various components of pollution, overall turbidity data will only be of value if combined with data from other sources on specific pollutants.

1973

53855 **APTIC NO. 77888**

Krasnokucki, A. and J. Raczkowski

NOMOGRAMS FOR THE CALCULATION OF POLLUTION DISSEMINATION. *Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(2):22-31, 1973, 14 refs.*

NTIS: TT 73-54096/2

The fairly complicated mathematical formulae used for calculating dissemination of pollution are simplified for specific situations. Nomograms have been prepared allowing for simple graphical determination of certain magnitudes, thereby simplifying and shortening the time necessary for their computation. Examples of the use of the nomograms are given. (Author abstract modified)

53856 **APTIC NO. 77850**

Martell, E. A.

THE DISTRIBUTION OF MINOR CONSTITUENTS IN THE STRATOSPHERE AND LOWER MESOSPHERE. *In: Physics and Chemistry of Upper Atmospheres. B. M. McCormac (ed.), Dordrecht-Holland, D. Reidel, 1973, p. 24-33. 27 refs.*

The effect of troposphere-stratosphere and stratosphere-mesosphere exchange on the distribution of minor constituents in the stratosphere and lower mesosphere are discussed. Tropospheric air rises slowly across the cold (193 + or - 5K) tropical tropopause where aerosols and water are largely removed by ice particle growth and sedimentation. Within the lower stratosphere, atmospheric constituents are spread poleward by the competing processes of eddy mixing and slow mean motions. Rates of meridonal and vertical eddy mixing in the stratosphere vary widely in time and space and are highest at the higher latitudes in winter. The stratospheric circulation clearly involves a well defined meridonal cell within each hemisphere, with upward flow in the tropical stratosphere, poleward transport in the middle stratosphere, and downward transport at high latitudes.

53857 **APTIC NO. 78187**

Mitsuse, T. and Y. Yamada

PURIFICATION OF CARBON MONOXIDE IN ATMOSPHERE BY SOIL. *(Tsuchi ni yoru taikichu issanka tanso no joka sayo ni tsuite). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, vol. 4:177-178, 1973. (Presented at the Japan Society of Civil Engineers, Lecture Meeting, 28th, Tokyo, Japan, 1973.)*

Tests were done by filling a 25 liter jar with soil and 500-1000 ppm CO, then sealing the jar. The test was carried out at 20 C. When air containing CO was present or when water was sealed into the jar, hardly any change occurred in CO-containing air concentration. When 4 kg of soil with 750 ppm CO were sealed together, the CO concentration reached zero after about a day. When the soil was dried at 300-400 C for about 2 hr, no purification effect was observed. When water was added, purification reached about 50%. Compost had a greater purification effect than the ordinary soil taken from the quadrangle of Osaka Municipal College campus. With the addition of cement, purification considerably decreased. When the water content was increased, purification also decreased. With the same weight of soil, loosely packed soil had greater (twice the purification) effect of tightly-packed soil. When the CO concentration reached zero, more CO was added, and the test was repeated. The purification was increased in this case. When the soil was covered with asphalt material 5 cm thick, very little purification effect took place. When soil surface was halved, effect decreased but not quite as much as 50%. Covering the soil with paper or filter paper, no great change in purification occurred. The maximum purification effect was obtained at 10-15 cm.

1972

53858 **APTIC NO. 77864**

Sheih, C. M. and W. J. Moroz

LAKE BREEZE POLLUTANT TRANSPORT MODELLING. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Rept. 295-73, 37p., Sept. 1972. 23 refs.*

A two dimensional lake breeze model covering both sides of the lake and allowing for various synoptic pressure gradients is described and applied to the Lake Ontario region to assess the relative pollution potential of the area. The model uses Estoque's techniques for the sea breeze and is essentially the extension of Moroz's lake breeze model with modifications in the treatment of the continuity equation, eddy diffusivity, boundary conditions, and numerical scheme. Application of the model to the cross section of Lake Ontario at Toronto (prevailing wind from north and perpendicular to the shore) reveals that the combination of the prevailing wind, onshore lake breeze, updraft over the land, and downdraft over the lake results in a closed circulation cell which is capable of trapping pollutants inside and accumulating the concentration to a hazardous level. The vertical velocity is downwind and the atmospheric stability is stable over the lake, making a plume drift downward and remain concentrated in a line without dispersion until it reaches the land. The congestion of pollutant sources from the center of the lake to the lake breeze front is thus inadvisable. (Author abstract modified)

BASIC SCIENCE AND TECHNOLOGY

1975

53859 **APTIC NO. 78325**

Annis, B. K. and E. A. Mason

THEORY OF THERMODIFFUSIOPHORESIS SPHERICAL AEROSOL PARTICLES. *J. Aerosol Sci., 6(2):105-117, 1975. 27 refs.*

Theoretical expressions for the motion of spherical aerosol particles in gas mixtures having both temperature and composition gradients are obtained that cover the free molecule to the continuum regime. The theoretical model treats the aerosol particles as one component of the multicomponent mixture, and yields explicitly the complete pressure and composition dependence of thermodiffusiophoresis. Effects of molecular internal degrees of freedom are included, but not effects connected with the thermal conductivity of the aerosol particles. Thermophoresis and diffusiophoresis interact in three ways with each other in thermodiffusiophoresis. Thermophoresis itself is enhanced in a mixture and diffusiophoresis itself is enhanced in the presence of a temperature gradient. There is a direct coupling term involving the translational thermal diffusion factor of the gas mixture. The model is extended to include finite boundary spacings. Thermophoresis for a single gas in transition with respect to both particle diameters and boundary spacing is worked out in detail. (Author abstract modified)

53860 **APTIC NO. 78179**

Bartholomew, Calvin H.

REDUCTION OF NITRIC OXIDE BY MONOLITHIC-SUPPORTED PALLADIUM- NICKEL AND PALLADIUM-RUTHENIUM ALLOYS. *Ind. Eng. Chem. Prod. Res. Develop., 14(1):29-33, March 1975. 14 refs. (Presented at the North American Meeting of The Catalysis Society, 3rd, San Francisco, Calif., Feb. 1974.)*

The effect of reaction parameters such as temperature, space velocity, and pollutant concentration on the performance of monolithic supported palladium-nickel and Pd-ruthenium alloys in reduction of nitric oxide was investigated in a laboratory reactor. Freshly prepared Pd-Ni and Pd-Ru catalysts convert 100% NO (1000 ppm) with less than 5% ammonia formation in 0.4% O2 (1% carbon monoxide and 250 ppm propylene) at 600 and 480 C, respectively. Conversions of NO, CO, and C3H6 decrease slightly with increasing space velocity. The effect of dynamic exposure to 100 ppm of sulfur dioxide is to lower slightly but reversibly the NO and C3H6 conversions while significantly and irreversibly lowering conversion to CO. After 100 hr of exposure in a reducing engine exhaust the conversions of NO, CO, and C3H6 over monolithic supported Pd-Ru/Al2O4 and Pd-Ni/NiAl2O4 are lowered 5-20% compared to freshly prepared samples. The leading 1.9 cm section appears less active than the adjacent 1.9 cm section suggesting deactivation by poisoning and/or loss of Ru. The Pd-Ni is significantly more stable catalytically on a NiAl2O4 wash coated monolith compared to a surface treated uncoated monolith. (Author abstract)

53861 **APTIC NO. 78294**

Batt, L., R. D. McCulloch, and R. T. Milne

THERMOCHEMICAL AND KINETIC STUDIES OF ALKYL NITRITES (RONO)-D (RO-NO), THE REACTION BETWEEN RO AND NO, AND THE DECOMPOSITION OF RO. *Intern. J. Chem. Kinet., vol. 1975:441-461, 1975. 67 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Thermodynamic and kinetic studies of the alkyl nitrite bond breakage into the alkoxy radical and nitric oxide in the gas phase were conducted with a conventional static system over a temperature range of 120-200 C. Apparent disagreement between previous kinetic and thermodynamic data for the dissociation of alkyl nitrites was resolved in terms of effects of two parallel reactions; a homogeneous radical split and either a homogeneous or a heterogeneous molecular elimination process. The rate coefficients for the combination and disproportionation of RO and NO were confirmed, with both showing zero activation energy. The activation energy associated with the alkyl nitrite bond breakage was calculated as 41.5 + or - 1 kcal/mol. (Author conclusions modified)

53862 **APTIC NO. 78042**

Becker, K. H., M. A. Inocencio, and U. Schurath

THE REACTION OF OZONE WITH HYDROGEN SULFIDE AND ITS ORGANIC DERIVATIVES. *Intern. J. Chem. Kinet., vol. 1975:205-220, 1975. 23 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Chemiluminescent and dark reactions of the aeronomically important trace gases hydrogen sulfide, methyl mercaptan, and dimethyl sulfide with ozone were studied in a flow tube and a low pressure reactor. The maximum of the oxidation rate and of the chemiluminescence intensity in the H2S/O3 system under static conditions was preceded by an induction period of up to several minutes. The oxidation rate depended strongly on the ozone concentration but followed no clearly defined rate law. The stoichiometry of ozone versus H2S consumption was close to unity only at high reaction rates. Trace amounts of nitrogen dioxide quenched the chemiluminescence and also reduced the rate of ozone consumption. More detailed studies in a flow tube revealed that singlet sulfur dioxide chemiluminescence accompanied the reactions of ozone with H2S as well as its methyl derivatives. Triplet SO2 was completely quenched at moderate fuel concentrations. A new emission spectrum that was characteristic only of the H2S/O3 system was discovered above 5200 A. Meinel bands from vibrationally excited hydroxyl radicals were observed in its place when the methyl derivatives were used as fuels. A reaction mechanism based on sulfhydryl and hydroxyl radicals and a long-lived intermediate was proposed. (Author abstract modified)

53863 **APTIC NO. 78046**

Benson, Sidney W.

CURRENT STATUS OF METHODS FOR THE ESTIMATION OF RATE PARAMETERS. *Intern. J. Chem. Kinet., vol. 1975:359-377, 1975. 53 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

An analysis of the metathesis reactions of small atoms and radicals is presented in terms of transition state theory. Most current data appear to be compatible with tight transition states in which the making and breaking bonds are not colinear. Many apparent metathesis reactions possess low or zero activation energies and very high A factors (about 10 to the 10 l/mol/sec; and these reactions are proposed to go through loose transition states resembling those appropriate for radical recombination since they actually do form a stable intermediate. Some anomalously low A factor reported are incompatible with even a tight transition state, and a reexamination of such data is suggested. Addition reactions of atoms and radicals also appear to fall into the same tight or loose transition state classes. Ion-pair (electron-donor) complexes are hypothesized as being formed and in turn stabilizing those atom and radical acceptors with high electron affinity and those donors with low ionization potentials. A recombination involving atomic oxygen and nitric oxide is explained in terms of a rotational NO-O complex in which the O atoms are nonequivalent and which can be quenced to nitrogen dioxide. Reactions involving chlorine atom and NO are similar, while the reaction of atomic oxygen with molecular oxygen goes via a tight complex. Some anomalously high activation energies for exothermic metathesis of carbon monoxide with O2 and NO2 are understandable when proper account is taken of the high endothermicity for the addition step. (Author abstract modified)

53864 **APTIC NO. 78047**

Benson, S. W., D. M. Golden, R. W. Lawrence, R. Shaw, and R. W. Woolfolk

ESTIMATION OF RATE CONSTANTS AS A FUNCTION OF TEMPERATURE FOR REACTIONS X PLUS YZ FORMING XY PLUS Z, X PLUS Y PLUS M FORMING XY PLUS M, AND X PLUS YZ PLUS M FORMING XYZ PLUS M, WHERE X, Y, AND Z ARE ATOMS, H, N, O. *Intern. J. Chem. Kinet., 1975: 399-440, 1975. 15 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st Warrenton, Va., Sept. 15-18, 1974.)*

A mathematical expression for rate constants of transfer reactions involving atomic and molecular hydrogen, nitrogen, and oxygen, nitric oxide, hydroxyl radicals, and HN radical is derived to provide a computer program for estimating rate constants of elementary chemical reactions for mathematical models of combustion processes. A table of rate constants for such reactions is listed which may prove useful in estimating other rate constants for reactions that have not been experimentally studied, especially for temperatures above 1000 K. A convenient form of the equilibrium constant that is suitable for combustion reactions is also given.

53865 **APTIC NO. 78002**

Bonzel, H. P. and T. E. Fischer

AN UV PHOTOEMISSION STUDY OF NO AND CO ADSORPTION ON PT (100) AND RU (1010) SURFACES. *Surface Sci., 51(1):213-227, July 1975. 29 refs.*

The adsorption of nitric oxide, carbon monoxide, and oxygen on platinum (100) and rubidium (1010) surfaces was investigated by Auger electron and ultraviolet photoemission spectroscopy (UPS) at substrate temperatures below 100 C. The adsorption of CO on Pt and Ru is non-dissociative. While for NO on Pt a UPS spectrum characteristic of molecular NO is identifiable, the spectrum for NO on Ru clearly indicates dissociation of NO into atomic nitrogen O at least for NO exposures below .0000015 torr sec. For high NO exposures the UPS spectrum shows evidence for molecular NO in addition to the dissociated species. The significance of the NO adsorption behavior on Pt and Ru with regard to the NO reduction reaction on these catalysts is discussed. (Author abstract modified)

53866 **APTIC NO. 78327**

Bradshaw, P.

LIGHT SCATTERING FUNCTIONS FOR PARTICLES USED IN THE DETERMINATION OF SMOKE PLUME CONCENTRATION. *J. Aerosol Sci., 6(2):147-156, 1975. 9 refs.*

Graphical results are given of the computed total scattering coefficients and angular scattering functions for light incident on spherical droplets comprising an oil smoke. Recurrence formulae are used for intermediate functions to economize on computer time. Unless increments in size parameter are as small as 0.005, it is not possible to represent the fine structure of the functions adequately. The effect of changes in relative refractive index of smoke particles in the atmosphere due to variations in the environmental index temperature is negligible, although the scattering functions increase in complexity as the refractive index increases. It is not possible to verify the theoretical curves experimentally for large particles due to the rapid variation of the functions with small changes in particle size. A brief description is given of the experimental work forming the basis of the research project for which the computations are made. The annotated program, written in FORTRAN for an ICL 1905L computer, is included. (Author abstract modified)

53867 **APTIC NO. 78010**

Brimblecombe, P. and D. J. Spedding

THE DISSOLUTION OF IRON FROM FERRIC OXIDE AND PULVERIZED FUEL ASH. *Atmos. Environ., 9(9):835-838, Sept. 1975. 21 refs.*

The significance of ferric ion dissolution in relation to the catalytic oxidation of sulfur dioxide was studied. Ferric oxide and pulverized fuel ash were used as models of natural and artificial sources of ferric ions in the atmosphere. Ferric oxide dissolved very slowly, whereas the iron present in pulverized fuel ash was quite soluble in water. About 80% of the iron leached out from ferric oxide was in the ferrous ion form, while all of the iron dissolving from pulverized fuel ash was in solution as ferric ion. About 70% of the total iron present in pulverized fuel ash was dissolved at a pH of 2.5 in contrast to only 2% being dissolved at a pH of 3.5 after 20 hr. Since the catalytic activity of iron depends on its solubility, ferric ion appears to play an important role in S02 oxidation in plumes from coal-burning energy sources.

53868 **APTIC NO. 77688**

Brock, J. R. and P. Middleton

RESEARCH IN AEROSOL DYNAMICS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-32.1.)*

Aerosol size and composition distributions in the atmosphere and in smog chambers was correlated with the theory of aerosol dynamics through mathematical descriptions and numerical simulation of the basic growth processes of particulate matter. The adverse effects of particulate matter in the atmosphere, evident in such familiar phenomena as reduction of visibility, increased incidence of respiratory disease, economic damage, and inadvertent weather and climate modification, are closely related to details of the aerosol size and composition distributions. The evolution of the particle size distribution in circumstances in which this evolution depends on primary source input, dispersion, coagulation, condensation, and homogeneous nucleation was studied. The numerical simulation of these processes under various assumptions as to the kinetic coefficients of the individual processes explains many of the features of the evolution of the particle size distribution observed in smog chamber experiments. (Author abstract modified)

53869 **APTIC NO. 78069**

Butler, Shahla, Carol Kahler, and Donald H. Levy

SOMEROBSERVATIONS ON THE CONTINUUM EMISSION FROM NO2. *J. Chem. Phys., 62(3):815-820, Feb. 1, 1975. 11 refs.*

Experiments on the continuum emission from nitrogen dioxide are discussed. The fluorescence spectrum of NO2 produced by laser excitation in the visible regions consists of a discrete banded structure superimposed on what appears to be a continuum. The intensity of continuum emission increases relative to that of the discrete emission as the pressure is raised. The continuum emission is produced by some collision mechanism. Magnetic quenching experiments are discussed which indicate the continuum/ discrete ratio is pressure independent. The continuum emission lifetime is longer than the discrete emission lifetime and allows a reinterpretation of previous observations which is not in conflict with the conclusion based on the magnetic quenching data. The continuum emission either originates in the isolated molecule or the cross section for any bimolecular process is extremely large.

53870 **APTIC NO. 78166**

Calvert, Jack G. and Robert D. McQuigg

THE COMPUTER SIMULATION OF THE RATES AND MECHANISMS OF PHOTOCHEMICAL SMOG FORMATION. *Intern. J. Chem. Kinet., vol. 1975:113-154, 1975. 89 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, Warrenton, Va., Sept. 15-18, 1974.)*

The kinetics and mechanisms of the homogeneous elementary reactions involved in photochemical smog formation were investigated. The rate of reactions in synthetic smog mixture of alkene, alkane, nitric oxide, nitrogen dioxide, carbon monoxide, CH2O (formaldehyde), CH3CHO (acetaldehyde), methane, and sulfur dioxide exposure to sunlight at z equals 40 deg were simulated by computer calculations. The theoretical effects of initial aldehyde impurity on the ozone and peroxyacetyl nitrate levels reached in these systems require that consideration of the concentrations of aldehyde contaminants be monitored and an account taken of their presence in the further development of control strategy for photochemical oxidant. The theoretical rates and mechanisms of NO2 and SO2 removal in synthetic smog mixtures are calculated and the nature of the product formed considered. The homogeneous removal paths for both of these gases account for a significant fraction of their rates of removal in real urban atmospheres. (Author abstract modified)

53871 **APTIC NO. 77813**

Chien, M. W., Irvin M. Pearson, and Ken Nobe

REDUCTION AND ADSORPTION KINETICS OF NITRIC OXIDE ON COBALT PEROVSKITE CATALYSTS. *Ind. Eng. Chem. Res. Develop., 14(2): 131-134, June 1975. 16 refs.*

The catalytic activities of cobalt perovskites and various cobalt oxides for the reduction of nitric oxide with carbon monoxide were studied under plug flow reactor conditions. Cobalt tetroxide showed the greatest catalytic activity after pretreatment with CO, and lanthanum strontium cobalt trioxide showed the least catalytic activity. The perovskite lanthanum cobalt trioxide displayed an intermediate activity between the two extremes. The reaction rates for all cobalt oxide and perovskite catalysts tested were zero order in CO and fractional order in NO. Nitric oxide was converted principally to nitrogen between 380 and 500 C; at lower temperatures more nitrous oxide was formed. The adsorption rate for a barium-dope perovskite which was a better catalyst for the NO-CO reaction that was LaCoO3 exceeded the rate for the latter, suggesting that the NO-CO reaction rate was influenced by the chemisorption rate of NO on the respective catalysts. (Author abstract modified)

53872 **APTIC NO. 782[illegible]6**

Chien, W. P. and J. D. Seader

PREDICTION OF SPECIFIC OPTICAL DENSITY FOR SMOKE OBSCURATION IN AN NBS SMOKE DENSITY CHAMBER. *Fire Technol., 1975:206-218, Aug. 1975. 17 refs.*

Specific optical density values for smoke obscuration were theoretically calculated and compared with measured values obtained under smoldering conditions in a National Bureau of Standards smoke density chamber. The materials used in the smoke density chamber studies were the NBS standard reference material SRM 1006, an 0.030-inch thick cotton linter paper consisting primarily of alpha cellulose and a 1/4-inch thick Douglas fir specimen. The theoretical values for specific optical density were calculated from light scattering and coagulation theories and from measurements of particulate mass concentration. The average smoke aging times of SRM 1006 and Douglas fir were estimated to be 6.75 and 6.5 min, respectively. The corresponding final average smoke droplet diameters were approximately 0.55 and 0.75 micron, respectively. The measured maximum specific optical density values for SRM 1006 and Douglas fir were 185 and 640, respectively, as compared with predicted values of 181 and 594, respectively. The agreement between measured and theoretical values was considered good, particularly for the SRM 1006 specimen.

53873 **APTIC NO. 78035**

Clyne, M. A. A. and L. W. Townsend

RATE CONSTANT MEASUREMENTS FOR RAPID REACTIONS OF GROUND STATE SULPHUR 3P4(3PJ) ATOMS. *Intern. J. Chem. Kinet., vol. 1975:73-84, 1975. 39 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Atomic resonance fluorescence was used to directly detect ground-state atomic sulfur (S(3Pj)) for the first time in a discharge flow system. Concentrations of S(3Pj) atoms between 1.0 times 10 to the 10/cu cm and 1.4 times 10 to the 12/cu cm were measured. The rate constants at 298 K for the bimolecular reactions of S(3Pj) with molecular oxygen, nitrogen dioxide, ozone, molecular fluorine, molecular chlorine, and molecular bromine were: 1.5 + or - 0.3 times 10 to the -12, 6.2 + or - 1.4 times 10 to the -11, 1.2 + or - 0.3 times 10 to the -11, 2.9 + or - 0.8 times 10 to the -13, 1.1 + or - 0.1 times 10 to the -11, and 9.5 + or - 1.7 times 10 to the -11 cu cm/molecule/sec, respectively. The ground state sulfur atom appeared to be more reactive than the analagous ground state oxygen atom. (Author abstract modified)

53874 **APTIC NO. 78103**

Conrad, H., G. Ertl, J. Kuppers, and E. E. Latta

INTERACTION OF NO WITH A NI (111) SURFACE. *Surface Sci., 50(2):296-310, June 1975. 19 refs.*

The interaction of nitric oxide with nickel (111) surface was studied by means of LEED, AES, ultraviolet photoelectron spectroscopy and flash desorption spectroscopy. Nitric oxide adsorbs with a high sticking probability and may form two ordered structures, c4 by 2 and hexagonal, from undissociated adsorbed NO. The mean adsorption energy is about 2 kcal/mole. Dissociation of adsorbed NO starts at -120 C, but the activation energy for this process increases with increasing coverage up to the value for the activation energy of NO desorption. The recombination of adsorbed nitrogen atoms and desorption of nitrogen occurs around 600 C with an activation energy of about 52 kcal/mole. A chemisorbed oxygen layer converts upon further increase of the oxygen concentration into epitaxial nickel monoxide. A mixed layer consisting of adsorbed nitrogen and adsorbed oxygen exhibits a complex LEED pattern and can be stripped of adsorbed oxygen by reduction with hydrogen. A series of new maxima at approximately -2, -8.8, and -14.6 electron volts is observed in the ultraviolet photoelectron spectra from adsorbed NO which are identified with surface states derived from molecular orbitals of free NO. Adsorbed N as well as adsorbed O causes a peak at -5.6 electron volts which is derived from the 2p electrons of the adsorbate. (Author abstract)

53875 **APTIC NO. 77879**

Corrin, Myron L.

NUCLEATION AS A COMPETITIVE FACTOR IN GAS-TO-PARTICLE CONVERSION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 5p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-62.1.)*

The pathways by which emitted gases are converted to particulate matter are considered. Homogeneous nucleation and physical or chemical adsorption are discarded as insignificant. Other factors considered include heterogeneous nucleation, heterogeneous catalysis, heteromolecular nucleation, and solubility. These are at present too poorly understood to permit evaluation of their relative importance. It is quite likely that many processes occur simultaneously and that the products of one such process are the raw material of another. (Author abstract modified)

53876 **APTIC NO. 78037**

Cox R. A.

THE PHOTOLYSIS OF GASEOUS NITROUS ACID - A TECHNIQUE FOR OBTAINING KINETIC DATA ON ATMOSPHERIC PHOTOOXIDATION REACTIONS. *Intern. J. Chem. Kinet., vol. 1975:379-398, 1975. 16 refs. Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The photolysis of gaseous nitrous acid in nitrogen/oxygen mixtures at 760 torr pressure was investigated. The major reaction occurring during absorption by HONO in the near ultraviolet was the dissociation of the acid into hydroxyl radicals and nitric oxide. Nitrous acid photolysis provides a useful source of OH radicals for kinetic studies under conditions similar to those prevailing in the lower atmosphere. With the addition of a large excess of carbon monoxide, the photolysis can also provide a source of hydroperoxyl radicals. Reaction rate constants at 300 K and 1 atmosphere pressure are given for the photolysis of HONO after the addition of CO, sulfur dioxide, and some simple olefins. (Author abstract modified)

53877 **APTIC NO. 78307**

Cox R. A., R. G. Derwent, and P. M. Holt

THE PHOTO-OXIDATION OF AMMONIA IN THE PRESENCE OF NO AND NO2). *Chemosphere, 4(4):201-205, Aug. 1975. 11 refs.*

The rate of formation of nitric oxide from the photolysis of nitrous acid in the presence of ammonia was measured in a series of experiments in which the concentration of HONO + NO + nitrogen dioxide was approximately 28.0 ppm. The HONO constituted about 75% of the total, the balance being NO and NO2 in roughly equal proportions. The measured rate constant for the photodissociation of nitrous acid was (0.72 + or -0.03) times 10 to the -2 power per sec. Increasing NH3/NOx led to a decrease in the rate of formation of nitric oxide divided by the initial HONO concentration, which approached zero with high NH3/NOx ratios. A steady state analysis comprising six chemical reactions yields an expression including rate constants. Several rate constants are determined. Two of the reactions, when taken together, include NH3 among the reactants and nitrogen and water as the products. It is therefore likely that NH3 oxidation acts as a net sink for NO in the stratosphere and troposphere.

53878 **APTIC NO. 77784**

Cupitt, L. T. and G. P. Glass

REACTIONS OF SH WITH ATOMIC OXYGEN AND HYDROGEN. *Intern. J. Chem. Kinet., vol. 1975:39-50, 1975. 13 refs. (Presented at the Proceedings of the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, Warrenton, Va., Sept. 15-18, 1974.)*

Reactions of the sulfhydryl radical were studied in a discharge flow system by monitoring the epr spectra that are observed when atomic hydrogen reacts with hydrogen sulfide in the presence of a large excess of oxygen. Rate constants for the reactions SH and H equals hydrogen and sulfur, SH and H equals H2 and S, and O and SH equals H and SO were measured at 295 K as 2.5 + or - 0.8 times 10 to the -11th power and 1.6 + or - 0.5 times 10 to the -10th power cu cm/molec/sec, respectively. Yellow wall deposits, that form in the absence of O2 are completely eliminated when sufficient O2 is added to the system. (Author abstract modified)

53879 **APTIC NO. 78295**

Currie, J. L., H. W. Sidebottom, and J. M. Tedder

THE REACTION OF N-BUTYL RADICALS WITH MOLECULAR OXYGEN AT LOW TEMPERATURES (AMBIENT TO 200 C). *Intern. J. Chem. Kinet., vol. 1975:477-491, 1975. 25 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The photolysis of azobutane in an oxygen atmosphere at 60 C yielded n-butyraldehyde and n-butanol as the principal products. However, even at this low temperature, fragmentation products were observed. The major products appeared to be formed through radical-radical reactions, with chain processes being unimportant at this temperature. Cyclic trioxy and tetroxy transition states are postulated to account for the products obtained and the very low activation energies observed for the low-temperature reactions. (Author abstract modified)

53880 **APTIC NO. 78121**

Demore, W. B.

RATE CONSTANT RATIO FOR THE REACTIONS OF OH WITH O3 AND CO. *Intern. J. Chem. Kinet., vol. 1975:273-279, 1975. 9 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphhere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The irradiation of mixtures containing oxygen, carbon dioxide, and water at 1849 A led to the production of ozone and carbon monoxide which eventually reached steady-state concentrations. The ratio of the steady-state concentrations depended only on the relative rates of light absorption by CO2 and O2 and the relative rate constants for the hydroxyl radical plus CO and OH plus O3 reactions. Experiments in the 271-333 K temperature range yielded an Arrhenius expression for the ratio of rate constants for the reactions of OH with O3 and with CO which was equal to 16.8 exp(-2450 divided by the product of the molar gas constant and absolute temperature). Taking the rate constant for the reaction of OH with CO as equal to 1.5 times 10 to the -13 cu cm/sec, independent of temperature, the rate constant for the reaction of OH with O3 was calculated as 2.5 times 10 to the -12 exp(-2450 divided by the product of the molar gas constant and absolute temperature). (Author abstract modified)

53881 **APTIC NO. 78230**

Fleming, J. W. and R. P. Wayne

FAR INFRARED ROTATIONAL SPECTRA OF OZONE AND NITRIC ACID VAPOUR. *Chem. Phys. Letters (Amsterdam), 32(1):135-140, April 1, 1975. 11 refs.*

The rotational spectra of ozone and nitric acid vapor was observed in the spectral region 0.01/cm to 0.04/cm, at a resolution of 0.005/cm. For O3, a theoretical absorption spectrum was computed for the same experimental conditions; excellent agreement was found. The data on HNO3 vapor represent the first high resolution absorption spectra with reliable intensity information. (Author abstract modified)

53882 **APTIC NO. 78127**

Gordon, Sheffield and William A. Mulac

REACTION OF THE OH(X2II) RADICAL PRODUCED BY THE PULSE RADIOLYSIS OF WATER VAPOR. Intern. J. Chem. Kinet., vol. 1975:289-299, 1975. 22 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)

Hydroxyl radicals were produced by pulse radiolysis of pure water vapor, water vapor containing OH scavengers, and mixtures of water vapor with argon and OH scavengers. The OH radical was detected in its ground state by its optical absorption at 3087 A. Its reaction with various compounds added to the water vapor was measured by following the change in absorption of the OH radical with time. Rate constants were determined for reactions of the OH radical with ammonia, nitrous oxide, nitric oxide, nitrogen oxide, sulfur dioxide, carbon monoxide, and various hydrocarbons at temperatures ranging from 298-440 K and pressures of water vapor ranging from 10-760 torr. The rate constant for the second-order disappearance of the OH radical in pure water vapor was also determined. (Author abstract modified)

53883 **APTIC NO. 78033**

Grimsrud, E. P., H. H. Westberg, and R. A. Rasmussen

ATMOSPHERIC REACTIVITY OF MONOTERPENE HYDROCARBONS, NOX PHOTOOXIDATION AND OZONOLYSIS. *Intern. J. Chem. Kinet., vol. 1975:183-195, 1975. 19 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The atmospheric reactivity of selected volatile monoterpenes was investigated by measuring their removal as induced by the photolysis of nitrogen oxides and their rates of reaction with ozone in air. Unlike most simpler hydrocarbons generally associated with urban pollution, reaction with ozone appeared to be of primary importance in the atmospheric breakdown of many terpene hydrocarbons. Ozone-monoterpene reactions in the laboratory generally exhibited good second-order rates, with the stoichiometries being dependent on the hydrocarbon type and its relative concentration. Terpenes with endocyclic conjugated diene systems were extraordinarily reactive due to their reaction with ozone. The relative importance of NOx photooxidation and ozonolysis in the initial breakdown of several monoterpenes is semiquantitatively described. (Author abstract modified)

53884 **APTIC NO. 78136**

Gupta, Roop N. and William L. Grose

SOME ASPECTS OF THE OZONE-DEPLETION PROBLEM IN THE STRATOSPHERE. *AIAA (Am. Inst. Aeron. Astronauts) J., 13(6):792-796, June 1975. 7 refs.*

A preliminary investigation of ozone depletion by nitrogen oxides in the exhaust of an SST wake is presented. Initial calculations are made using a model employing a two step chemistry mechanism consisting of an NOx catalytic cycle and assuming total NOx and the ratio nitric oxide/ nitrogen dioxide to be conserved. The current O3 depletion rates are too large due to the fact that atomic oxygen, needed to sustain the catalytic cycle, is depleted at unrealistically higher rates than can be produced by the photodissociation of NO2 and O3 to satisfy the restrictive assumption of NO conservation. Because of the apparent deficiencies in the two-step chemical model, a model is presented with a more realistic chemical mechanism without the requirement of NO conservation. The model includes water vapor and NO nitric acid production reactions as well as the NOx catalytic cycle. Total NOx and initial NO/NO2 ratio play an important role in determining O3 depletion. Only in the case of rather extreme concentrations of water vapor or unrealistically large photolysis rates is there any significant conversion of NOx to HNO3. (Author abstract modified)

53885 **APTIC NO. 78044**

Hack, W., K. Hoyermann, and H. G. Wagner

THE REACTION NO PLUS HO2 TO GIVE NO2 PLUS OH WITH OH PLUS H2O2 TO GIVE HO2 PLUS H2O AS AN HO2-SOURCE. *Intern. J. Chem. Kinet., vol. 1975:329-339, 1975. 17 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The reaction of nitric oxide with hydroperoxyl radical and the reaction of hydroxyl radical with hydrogen peroxide were studied in an isothermal flow reactor at pressures around 2 torr with helium as the main carrier gas in an effort to investigate the production of HO2 radicals. The reaction of NO with HO2 radical led to the production of OH radical and nitrogen dioxide. The reaction of OH with hydrogen peroxide in turn led to the production of HO2 radicals and water. Rate constants for each reaction are represented in Arrhenius form. The upper limit for the reaction constant involving the reaction of OH with HO2 to give water plus molecular oxygen is also presented.

53886 **APTIC NO. 77818**

Hashida, Isao and Masato Nishimura

ADSORPTION OF NITROGEN DIOXIDE ON VARIOUS POLY(VINYLPYRIDINE) RESINS WITH POROUS STRUCTURE. *(Takosei biniru pirijin jushi ni yoru nisanka chisso no kyuchaku). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), 8(2):383-389, 1975. 29 refs.*

The adsorption capacity of polyvinylpyridine resins for nitrogen dioxide was examined using gravimetric methods and spectral analysis. Poly-4-vinylpyridine showed an adsorption capacity similar to that of poly-2-methyl-5-vinylpyridine, and both possessed greater adsorption capacities than either poly-2- vinylpyridine or poly-5-ethyl-2-vinylpyridine which also were similar to each other in adsorption capacity. Differential heats of adsorption for poly-4-vinylpyridine and for poly-5-ethyl-2-vinylpyridine were 4.1-5.0 and 1.0-1.9 kcal/mol, respectively. The infrared spectrum of NO2 adsorbed on 4-vinylpyridine homopolymer film showed asymmetrical and symmetrical stretching bands at 1630 and 1325/cm, respectively; the characteristic absorption band of nitrogen tetroxide disappeared. The characteristic absorption appeared to occur via a dipole-dipole interaction between NO2 and the pyridyl group. Poly-4-vinylpyridine resin which was exposed to NO2 for 25 min at 23 mm mercury pressure exhibited an anisotropic electron spin resonance signal with g values of 2.022, 2.004, and 1.983 at room temperature. As the resin was saturated with NO2, the g values of 2.022 and 1.983 decreased, and an anisotropic signal with g values of 2.014, 2.004, and 1.988 appeared simultaneously. The spectra observed were not due to the signal of NO2 but rather to a radical formed on ethyl benzene or divinyl benzene which was used as a crosslinking reagent in the preparation of the resin.

53887 **APTIC NO. 78389**

Hay, P. Jeffrey, Thom. H. Dunning, Jr., and William A. Goddard, III

CONFIGURATION INTERACTION STUDIES OF O3 AND O3+. GROUND AND EXCITED STATES. *J. Chem. Phys., 62(10):3912-3924, May 15, 1975. 4 refs.*

Extensive configuration interaction calculations (double zeta) on the ground and 15 excited states of ozone and the eight lowest states of the O3+ ion are reported. The studies on O3 are carried out as a function of both bond length and bond angle. Three excited states of O3 are bound with respect to the ground states of oxygen molecule and O atom. Additional information is provided on the ring state (60 degree bond angle) previously reported. Two of the excited states of O3 are known spectroscopically and the ionization potentials of the first three states of O3+ are not shown experimentally. These experimental results are in good agreement with the theoretical calculations. (Author abstract modified)

53888 **APTIC NO. 78293**

Heicklen, Julian and Menachem Luria

KINETICS OF HOMOGENEOUS PARTICLE NUCLEATION AND GROWTH. *Intern. J. Chem. Kinet., vol. 1975:567-580, 1975. 18 refs (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The kinetics of homogeneous particle nucleation and growth are reviewed for systems in which nucleation rate data are available. Systems considered include: water vapor condensation, metal oxide production, photoexcitation of sulfur dioxide-hydrocarbon systes , ammonium nitrate production from the reaction of ammonia and nitric acid, and ammonium chloride production from the reaction of ammonia with hydrogen chloride. The kinetic data for nucleation associated with each of these systems can be fitted to a simple equilibrium theory expression that states the nucleation rate is equal to the nucleation rate coefficient multiplied times the concentration of the nucleating species to the q plus 1 power, where q is the critical cluster size required for nucleation to proceed. A q plus 1 value of 38 fits the data for water vapor at -5 C, while for other systems q is very much smaller. For example, the q plus 1 values for photoexcited SO_2-acetylene and SO_2-allene systems at room temperature are 3.6 and 6.7, respectively. Data for metal oxide formation is very limited. Dissociation appears to be complete in the vapor phase for the NH_4NO_3 system; while data is more limited for the NH_3-HCl system, it may be dissociated in the vapor phase also. (Author abstract modified)

53889 **APTIC NO. 78296**

Hippler, H., C. Schippert, and J. Troe

PHOTOLYSIS OF NO_2 AND COLLISIONAL ENERGY TRANSFER IN THE REACTIONS O PLUS NO FORMING NO_2 AND O PLUS NO_2 FORMING NO_3. *Intern. J. Chem. Kinet., vol. 1975:27-38, 1975. 26 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The photolysis of nitrogen dioxide (4-5 torr) at 366 nm and the collisional energy transfer of 18 different inert gases involved in combination reactions of oxygen atoms with nitric oxide and NO_2 were studied. The role of nitric anhydride in the mechanism and corresponding time dependence of the quantum yield was also evaluated. The relative collision efficiencies of each inert gas are tabulated for each reaction and are evaluated in terms of the average energies transferred per collision. A theoretical analysis of the recombination rate constants is also presented. (Author abstract modified)

53890 **APTIC NO. 78128**

Hucknall, D. J., D. Booth, and R. J. Sampson

REACTIONS OF HYDROXYL RADICALS WITH ALKANES. *Intern. J. Chem. Kinet., vol. 1975:301-316, 1975. 17 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The oxidation of alkanes in the presence of decomposing hydrogen peroxide vapor in an aged boric acid-coated reactor at temperatures between 613 and 653 K is interpreted in terms of a simple, nonchain mechanism. According to this mechanism, hydroxyl radicals are the principal species responsible for alkane removal. The alkyl radicals then appear to react almost exclusively with oxygen to give the conjugate alkene. The resulting hydroperoxyl radical from latter reaction does not apparently continue the chain. Rate constant ratios for the attack of hydroxyl radicals on several pairs of alkanes are derived. (Author conclusions modified)

53891 **APTIC NO. 78032**

Huie, Robert E. and John T. Herron

TEMPERATURE DEPENDENCE OF THE RATE CONSTANTS FOR REACTIONS OF OZONE WITH SOME OLEFINS. *Intern. J. Chem. Kinet., vol. 1975:165-181, 1975. 18 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The temperature dependence of the rate constants for the reactions of ozone with some selected olefins was studied using a stopped-flow reactor in conjunction with a beam sampling mass spectrometer. Studies of the effect of molecular oxygen on the measured rate constants revealed that O_2 scavenges free radical species which are capable of further reacting with O_3. A good linear correlation appeared between the activation energy for a given reaction and the ionization potential of the olefin. Mathematical expressions for the log of the rate constant in terms of absolute temperature are given for 1-butene, 2-methylpropene, cis-2- butene, trans-2-butene, 2-methyl-2-butene, and 2,3-dimethyl- 2-butene. (Author abstract modified)

53892 **APTIC NO. 77936**

Jaffe, Raphael J.

LIGHTING EFFECTS IN SMOG SIMULATION: I. CONSTANT INTENSITY VS. DIURNAL VARIATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-16.5.)*

Photochemical reaction products in a smog chamber were compared for two types of lighting conditons, viz., constant light intensity and diurnal simulation approximating the variation in light intensity that occurs from sunrise to sunset. A propylene/ nitrogen oxide reaction system was employed at a temperature of 95 F and a relative humidity of 25%. The smog chamber was illuminated by an external 6500 watt xenon arc lamp. The optics yielded a collimated beam of light that provided a spectral distribution from 300-400 nm wavelength. There were significant variations in the behavior of propylene and ozone on a scaled-time basis. In comparison to the constant lighting conditions, the diurnal lighting test resulted in an ozone maximum concentration that was lower by 10%, a more rapid drop off in ozone toward the end of the run, and obvious acetaldehyde and peroxyacetyl nitrate buildup and decay behavior. The diurnal simulation pattern increased the elapsed time to oxidant maximum which more closely simulated the observed time pattern for oxidant buildup in the atmosphere. (Author abstract modified)

53893 **APTIC NO. 78107**

Jaroniec, M.

ADSORPTION OF GAS MIXTURES ON HETEROGENEOUS SURFACES: ADSORPTION OF CARBON DIOXIDE AND XENON ON ALUMINUM OXIDE. *J. Colloid Interface Sci., 52(1):41-45, July 1975. 20 refs.*

Isotherms of adsorption from a mixture of carbon dioxide and xenon on aluminum oxide at 173 K, obtained in a previous experiment, are discussed. Adsorption energy distributions are calculated. The heterogeneous surface of the adsorbent is taken into consideration in the interpretation of the data.

53894 **APTIC NO. 78109**

Jones, W. P.

THE EFFECT OF TEMPORAL FLUCTUATIONS IN TEMPERATURE ON NITRIC OXIDE FORMATION. *Combustion Sci. Technol., 10(1-2):93-96, 1975. 4 refs.*

The influence of temperature fluctuations on nitric oxide formation was investigated by calculating NO levels with a range of prescribed temperature fluctuations about various mean temperatures. Nitric oxide levels about an order of magnitude above those predicted with zero fluctuation may arise at temperature fluctuation levels typically to be found in gas turbine combustion chambers. There is also some evidence that temperature fluctuations become of increasing importance as the mean temperature is reduced. Predictions made with reaction rates calculated from mean temperatures may seriously overestimate the reductions in NO emissions. (Author abstract modified)

53895 **APTIC NO. 78198**

Jordan, J. and R. D. Penzhorn

HOMOGENEOUS PARTICLE GROWTH FROM THE REACTION OF SO2 WITH N-BUTANE. *Ber. Bunsen ges. Physik. Chem., 79(3):266-270, March 1975. 13 refs.*

The growth of homogeneous particles from the reaction of sulfur dioxide with n-butane is discussed. Photolysis of SO2 with n-butane results in several products which condense to particles. The particle mass concentration (pmc) and the rate of product formation are measured in this system during and after photolysis. After a certain irradiation time a maximum pmc is reached. The height of the pmc maximum is a function of the photochemical reaction rate. Simple model considerations show that the photochemically produced aerosols are lost mainly by sedimentation, are monodisperse, and that the particle size is relatively insensitive to the photochemical reaction rate. (Author abstract modified)

53896 **APTIC NO. 77980**

Klepper, Betty and D. K. Craig

DEPOSITION OF AIRBORNE PARTICULATES ONTO PLANT LEAVES. *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., USAEC Contract AT(45-1)-1830, 16p., 1975 (?). 6 refs.*

NTIS: BNWL-SA-4945

The measurement of deposition characteristics of airborne pollutants released in stack effluents from industrial plants allows assessment of environmental hazards from foliar absorption. An exposure chamber permits highly toxic materials, such as plutonium compound aerosols, to be delivered to plant leaves under reproducible conditions of wind speed and aerosol concentration. An aerosol of gold colloid labelled with 198Au and having an AMAD of about 0.8 micron was used in experiments with bean leaves and inert surfaces. Leaf projection area, wind speed, aerosol concentration, and particle size distribution were measured. Leaves oriented toward and away from winds of 0.42 cm/sec showed similar deposition rates for particles within AMAD of about 0.8 micron. Deposition velocities for leaves were similar deposition velocities measured for upward facing inert surfaces and were greater than velocities for downward facing surfaces. (Author abstract modified)

53897 **APTIC NO. 78018**

Komiyama, Hiroshi and J. M. Smith

SULFUR DIOXIDE OXIDATION IN SLURRIES OF ACTIVATED CARBON. PART I. KINETICS. *Am. Inst. Chem. Engrs. J., 21(4):664-676, July 1975. 14 refs.*

Dynamic adsorption and reaction studies of the catalytic oxidation of sulfur dioxide in aqueous slurries of activated carbon at room temperature and atmospheric pressure were performed. The mass transfer resistances were of minor importance for the carbon particle diameter used (0.03 mm); thus, the data were analyzed in terms of the kinetics of the chemical reaction. A pseudo steady state of several hours duration was observed, with the reaction rate being constant. Fluid-to-particle resistance and intraparticle mass transfer resistance in the liquid-filled pores retarded the reaction rate up to 20%. The reaction rate was first order in dissolved oxygen and zero order in SO2. Adsorption of SO2 was very rapid; and the equilibrium isotherm was strongly nonlinear, following a Freundlich equation. The controlling step in the reaction mechanism appeared to be the adsorption of oxygen on active sites of the carbon surface. The low concentration of oxygen in water (due to its low solubility) reduced its rate of adsorption. (Author abstract modified)

53898 **APTIC NO. 77772**

Ledger, J. D.

A FINITE-DIFFERENCE APPROACH FOR SOLVING THE GAS DYNAMICS IN AN ENGINE EXHAUST. *J. Mech. Eng. Sci., 17(3):125-132, June 1975. 22 refs.*

Finite difference schemes are considered for solving the unsteady, compressible gas flow in the exhaust pipe of a turbocharged diesel engine. The most promising scheme, based on centered differencing is developed to incorporate the boundary conditions applicable to the exhaust problem. Good comparisons are obtained with results for pipe pressure from characteristics programs at intermediate and final stages of the development. Recommendations are made for reducing the computation time of the centered difference program. (Author abstract modified)

53899 **APTIC NO. 77940**

Lioy, Paul J., George T. Wolff, and Raymond M. Manganelli

AEROSOL RESCUE RESEARCH AT RUTGERS UNIVERSITY: 1. BEHAVIOR OF SOLUBLE PARTICLES, AND 2. SURFACE INTERACTION OF GASES ON SOLID PARTICLES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-32.6.)*

Aerosol research in two aspects of submicron particle behavior in environmental systems is described. The growth of submicron particle aerosol generated from pure sodium chloride solutions and brackish water, collected at the input to a cooling tower was studied at a carrier air temperature of 18 C-19 C and at specific relative humidities between 80-90%. The heterogeneous nature of the brackish water aerosol tends to limit growth, and ultimate droplet size, when compared to that obtained for the saline droplet aerosol. The nature of the heterogeneous surface interactions of sulfur dioxide and metal oxide aerosols was studied. Chemisorption of SO2 is strongly influenced by relative humidity. Two regimes of chemisorption are discerned: from 0-40% relative humidity, and from 40-less than 100%. When cadmium oxide contains less than a monolayer of SO2, the amount of sulfate formed is directly proportional to the amount of sorbed SO2. Large particles are effective in oxidizing SO2 because they contain more adsorbed water. (Author abstract modified)

53900 **APTIC NO. 78218**

Makhlitt, R. and A. G. Sardanashvili

SORPTION PROPERTIES OF VARIOUS ADSORBENTS FOR SULFUR COMPOUNDS IN A JET FUEL CUT. *Int. Chem. Eng., 15(2):212-215, April 1975. 4 refs.*

The adsorption capacity, sorption rate, and diffusivity of silica gel, aluminosilicate, and zeolite adsorbents for the removal of sulfur compounds from jet fuel was examined. A silica gel adsorbent showed the greatest adsorption capacity for sulfur compounds in a 140-280 C cut from Romashkino crude. Aluminosilicate adsorbent was next in adsorption capacity, followed by zeolite. However, zeolite showed a greater adsorption capacity than aluminosilicate for dihexyl sulfide. The most rapid approach to adsorption equilibrium was observed for the aluminosilicate catalyst with a grain size of 0.5-1.0 mm. The next fastest was for silica gel (0.5-1.0 mm) and the slowest for aluminosilicate with a grain of 4 mm. Sorption kinetics studies revealed that silica gel requires 90 min to reach a degree of adsorption, whereas aluminosilicate requires only 30 min. (Author conclusions modified)

53901 **APTIC NO. 78126**

Margitan, J. J., F. Kaufman, and J. G. Anderson

KINETICS OF THE REACTION OH PLUS HNO3 GIVES H2O PLUS NO3. *Intern. J. Chem. Kinet., vol. 1975:281-*

287, 1975. 22 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)

The kinetics of the reaction of hydroxyl radical with nitric acid to give water and nitrate were studied over the temperature range of 270-470 K in a flow system utilizing ultraviolet resonance fluorescence detection of OH. The reaction kinetics were pseudo-first order in OH and were uncomplicated by secondary reactions. A temperature independent rate constant of 8.9 + or - 1.3 times 10 to the -14 cu cm/sec was obtained, with the uncertainty representing a single standard deviation (including estimates of systematic errors).

53902 **APTIC NO. 78125**

Mulcahy, M. F. R. and B. C. Young

HETEROGENEOUS REACTIONS OF OH RADICALS. *Intern. J. Chem. Kinet., vol. 1975:595-609, 1975. 29 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The nature and kinetics of reactions of hydroxyl radicals at the surfaces of graphite or pyrex glass treated with aqueous orthophosphoric acid were studied in a flow system at 298 K by mass spectrometric analysis of the reaction products. The OH radicals were generated in the presence of excess hydrogen atoms by the reaction of atomic hydrogen with nitrogen dioxide to give OH radicals and nitric oxide. The main reaction by which OH radical was destroyed at either surface appeared to be the reaction of H with OH to yield water. On the graphite surface, OH radicals also reacted with the substrate to produce approximately equal amounts of gaseous carbon monoxide and carbon dioxide, with the combined rate of OH consumption by these reactions being about 1/3 that for the reaction of OH with H. The collision efficiency for the loss of OH was about 0.01 for the treated pyrex and greater than 0.05 for the graphite surface. The results suggest that the rate of destruction of OH at the surface of aerosol particles in urban air is unlikely ever to approach the rate at which OH reacts with gaseous pollutants present. Also the lifetime of soot particles in the presence of the currently estimated concentration of OH in the lower troposphere is likely to be between 5 mo and 5 yr. (Author abstract modified)

53903 **APTIC NO. 78151**

Nakano, K., K. Yokota, M. Hayafuku, and A. Kobayashi

SURVEY ON THE PHOTOCHEMICAL REACTION OF HYDROCARBONS. *(Tankasuiso no kokagakuhanno sei chosa ni tsuite). Text in Japanese. Tokyo-To Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:32-42, 1975. 4 refs.*

Twenty-two hydrocarbons and organic solvents were irradiated in a polyvinyl fluoride bag and the formation of secondary pollutants was studied. The bag was flushed with research-grade air, heated with infrared lamps and again flushed with air. Twenty-four FL 40S-BL-B fluorescent light bulbs were used as the light source. Sample gas containing 2 ppm hydrocarbon, 1 ppm nitric oxide (contaminated by a small amount of nitrogen dioxide), and research-grade air for the balance was irradiated at 30 C and 50% relative humidity for 6 hr. The reaction mixture was analyzed once every 30-60 min. Hydrocarbons were analyzed by GC gas chromatography with FID flame ionization detector, and ozone by chemiluminescence method, and peroxyacetyl nitrate nitrogen oxides by GC with SCD. The NO decreasing rate and NO2 increasing rate in the absence of hydrocarbon were about 0.94-1.24 ppb/min while at 2 ppm propylene, the rates were about 4.2-6.0 ppb/min. Maximum NO2 concentration was observed in 20 min in the presence of 1 ppm mesitylene but in approximately 360 min in benzene, cyclohexane, and ethyl acetate.

53904 **APTIC NO. 78303**

Narain, Jai Prakash

THREE DIMENSIONAL TURBULENT WALL JETS. *Can. J. Chem. Eng., 53(3):245-251, June 1975. 12 refs.*

Jets issuing tangentially to an impermeable flat surface from orifices of finite aspect ratio are termed three dimensional wall jets. The turbulent flow of viscous incompressible fluid associated with such wall jets has been investigated analytically. A theory was developed for the flow development of three dimensional wall jets issuing from bluff orifices of various cross section and slender orifices of rectangular cross section. The investigation uses the classical momentum integral approach in the three dimensional configuration. The potential core region is followed a characteristic decay region where maximum velocity decays in a manner dependent on the shape and aspect ratio of the orifice. Following this region, there is a radial wall jet type maximum velocity decay region. All three dimensional wall jets issuing from any arbitrary cross-sectional orifice decay in a similar manner in this radial decay region. The half-velocity width grows faster in the transverse direction than in a direction normal to the flat surface. The analytical results agree reasonably well with existing experimental results. (Author abstract modified)

53905 **APTIC NO. 77766**

Orsini, Rocco A., Steven A. Tunick, George L. Baurle, and Ken Nobe

NITRIC OXIDE REDUCTION WITH HYDROGEN ON COPPER-NICKEL AND CHROMIUM-NICKEL CATALYSTS. *Atmos. Environ., 9(9):777-784, Sept. 1975. 13 refs.*

The reduction of nitric oxide with hydrogen on copper-nickel and chromium-Ni catalysts was investigated. Both CuNi and CrNi catalysts are prepared by impregnation of aluminum oxide pellets. Dry pressed catalysts, CrNi with Al2O3 powder are formed with several catalysts containing the nickel chromate spinel. A pressed nickel oxide catalyst is highly active for the reduction of NO while impregnated NiO is much less active. Copper oxide and chromium oxide are relatively inactive. Addition of small amounts of copper to impregnated NiO improves the activity of the latter catalyst, but above 24 atomic % Cu, activity decreases with increase in Cu content. The activity of the pressed Cr-Ni catalysts increases with an increase in Ni content. Production of ammonia maximizes at intermediate Ni content for the impregnated CuNi catalysts, and decreases with increase in Ni content for the impregnated CrNi catalysts and increases with Ni content for the pressed CrNi catalysts. (Author abstract modified)

53906 **APTIC NO. 78124**

Penzhorn, R. D., W. G. Filby, K. Guenther, and L. Stieglitz

THE PHOTOREACTION OF SULFUR DIOXIDE WITH HYDROCARBONS. II. CHEMICAL AND PHYSICAL ASPECTS OF THE FORMATION OF AEROSOLS WITH BUTANE. *Intern. J. Chem. Kinet., vol. 1975:611-627, 1975. 31 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The aerosol products from the photoreaction of sulfur dioxide with short-chain alkanes, particularly butane were investigated with combined gas chromatography-mass spectrometry. The reaction of triplet SO2 with alkanes involved a proton abstraction as the primary step rather than an insertion and/or a dissociative collision. Triplet SO2 attacked carbon-hydrogen bonds specifically, resembling simple free radicals and atoms in this respect. Subsequent reactions were governed by the ease of formation and stability of the alkyl sulfonyl radicals which tended to disproportionate rather than recombine or abstract protons. The RSO2 radicals gave rise to sulfonic acid and thiosulfonate via reactions involving the hydrosulfonyl radical. Some derived rate constant ratios are presented along with proposed reaction mechanisms. (Author abstract modified)

53907 **APTIC NO. 78036**

Polanyi, J. C. and J. J. Sloan

DETAILED RATE CONSTANTS FOR THE REACTIONS H PLUS O3 FORMING OH(V, J) PLUS O2, AND H PLUS NO2 FORMING OH(V, J) PLUS NO. *Intern. J. Chem. Kinet., vol. 1975:51-60, 1975. 14 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The arrested relaxation variant of the infrared chemiluminescence method was used to obtain information on the initial vibrational, rotational, and spin-state distribution in hydroxyl radical formed during the reaction of atomic hydrogen with ozone. The mean fractions of the total energy (about 79 kcal/mol) entering vibration and rotation in the OH radical were approximately 0.90 and 0.03, respectively. Studies of the reaction of H with nitrogen dioxide to give OH radical and nitric oxide revealed that the mean fractions of total energy (31 kcal/mol) entering vibration and rotation were rough 0.30-0.50 and 0.20-0.30, respectively. The extent of vibrational excitation was significant and appeared to differ notably from that in the OH product of the reaction involving H and O3. Experimental evidence points to a rapid vibrational deactivation of OH in collisions with NO2 without a change in the extent of rotational excitation. The differing vibrational and rotational distributions between H plus O3 and H plus NO2 are discussed in terms of possible interaction potentials. (Author abstract modified)

53908 **APTIC NO. 78176**

Schnell, Walter and Gaston Fischer

CARBON DIOXIDE LASER ABSORPTION COEFFICIENTS OF VARIOUS AIR POLLUTANTS. *Appl. Opt., 14(9):2058-2059, Sept. 1975. 4 refs.*

The carbon dioxide laser absorption coefficients of various air pollutants were determined. Monitoring pollutants near their sites of emission and by point sampling are important to the safety of workers in such processes as dry cleaning with perchloroethylene, ultrasonic cleaning with trichloroethylene, and refrigeration and aerosol spraying with Freon. The sensitivity and largest absorption coefficients as observed at 293 + or - 2 K and 360 + or - 2 torr nitrogen pressure are determined for ethylene, ammonia, ozone, water, tetrachloroethylene, trichloroethylene, and dichlorodifluoromethane. One valuable property of the system used in these determinations is the small volume of the sample cell (100 cc), so very small amounts of gases are required for point sampling analysis or in situ monitoring, and the cell is quickly conditioned. The new clean gas handling system with glass cells and pipes is much less prone to adsorption than the previous metal system. The method is rapid, inasmuch as the optical absorption measurement at a particular wavelength requires only a few seconds.

53909 **APTIC NO. 77773**

Seiyama, Tetsuro, Tsuyoshi Arakawa, Toshio Matsuda, Noboru Yamazoe, and Yusaku Takita

CATALYTIC REDUCTION OF NITRIC OXIDE WITH AMMONIA OVER TRANSITION METAL ION-EXCHANGED Y ZEOLITES. *Chem. Lett., no. 7:781-784, 1975. 7 refs.*

The catalytic reduction of nitric oxide with ammonia was studied over transition metal ion-exchanged Y zeolite (Me-Y) catalysts. The reaction products are nitrogen, nitrous oxide, and water in all cases. Selectivities to N2 are 60-80% on all the cation exchanged zeolite catalysts exhibiting a relatively minor variation with the cationic species exchanged. The copper (II)-Y catalyst exhibits low temperature activity and has an unusual catalytic activity-temperature profile with a maximum at 120 C. The catalytic activity is enhanced considerably when a second cation, especially cobalt (II) or iron (III) is co-exchanged together with Cu (II) in Y zeolite. (Author abstract modified)

53910 **APTIC NO. 78122**

Slagle, Irene R., James R. Gilbert, Ronald E. Graham, and David Gutman

DIRECT IDENTIFICATION OF REACTIVE CHANNELS IN THE REACTION OF HYDROXYL RADICALS WITH ALLENE, PROPYLENE AND 2-BUTENE. *Intern. J. Chem. Kinet., vol. 1975:317-328, 1975. 26 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The routes of the reactions of hydroxyl radical with allene, propylene, and 2-butene were identified with the aid of high intensity crossed molecular beams. Products were detected and identified using photoionization mass spectrometry. Abstraction of a hydrogen atom from the olefin was observed in all three reactions, and the free radical product from this route appeared dominant on the mass scans obtained in the OH plus C3H6 and OH plus C4H8 reactions. The reaction of OH with olefins containing allylic hydrogens was proposed to proceed primarily by direct H-atom transfer at one of these hydrogens. Evidence that the OH plus olefin reactions also proceed by addition was also obtained. The OH-C3H4 adduct was detected as well as fragments of the decomposition of the OH-olefin adducts for all three reactions. Since OH plus olefin reactions play a major role in the photochemical smog diurnal cycle, knowledge of the identities of the reactive intermediates and stable products they produce together with quantitative information on the relative importance of their various reactive routes is essential for obtaining a quantitative understanding of atmospheric transformations in polluted air. The presence of a significant abstraction route in OH plus olefin reactions is suggested for consideration in future detailed smog modeling studies. (Author abstract modified)

53911 **APTIC NO. 78045**

Smith, Ian W. M. and Reinhard Zellner

RATE MEASUREMENTS OF OH BY RESONANCE ABSORPTION. IV. REACTIONS OF OH WITH NH3 AND HNO3. *Intern. J. Chem. Kinet., vol. 1975:341-351, 1975. 23 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

Rate constants were determined for the reaction of hydroxyl radical with ammonia between 228 and 472 K and for the reaction of OH radical with nitric acid between 240 and 406 K. The removal of OH radical was in both cases followed by measuring the absorption of OH resonance radiation as a function of time. The results for the first reaction were expressed in terms of an Arrhenius expression equal to 2.3 times 10 to the -12 exp(1.6 kcal/mol divided by molar gas constant times the absolute temperature)cu cm/molecule/sec with a standard deviation of + or - 0.03 in the log of the rate constant. The rate constant for the second reaction varied little with temperature and was equal to 0.8 + or - 0.2 times 10 to the -13 cu cm/molecule/sec.

53912 **APTIC NO. 77780**

Smoot, L. Douglas and Larry D. Allred

PARTICLE-GAS MIXING IN CONFINED NONPARALLEL COAXIAL JETS. *AIAA (Am. Inst. Aeron. Astronaut.), 13(6):721-722, June 1975. 4 refs. (Presented at the AIAA/SAE Propulsion Conference, 10th, San Diego, Calif., Oct. 21-23, 1974, Paper 74-1158.)*

The results of 52 tests on particle gas mixing in confined nonparallel coaxial jets are summarized. Mixing rates of a primary helium/aluminum particle/air jet with a secondary, nonparallel air jet were measured. Injection angle, primary density, and secondary velocity were varied and mixing rates of the gas and particles were measured. Results are applicable to the design of airbreathing propulsion systems. The primary recess has little effect on mixing rates for any of the test conditions. The measured effect of variation in initial gas velocity and density on mixing rate is approximately the same for helium composition, gas velocity, and particle mass flux. The greatest change in rates of mixing is encountered with the initial change from parallel flow to small nonparallel flow angles.

53913 **APTIC NO. 77804**

Solymosi, Frigyes and Janos Kiss

SNO2-CR2O3 AS A CATALYST FOR THE LOW-TEMPERATURE REDUCTION OF NITRIC OXIDE. *(A nitrogen-monoxid alacsony homersekletu redukcioja SnO2-Cr2O3 katalizatoron). Text in Hungarian. Mag. Kem. Folyoirat, 81(3):143-144, 1975.*

Tin oxide containing a small amount of chromium oxide was found to be a very active substance for the adsorption and catalytic reduction of nitric oxide in the presence of carbon monoxide, hydrogen, and ethylene at low temperatures. The high activity of the catalyst was attributed to the easily reducible and reoxidizable higher-valence chromium ions formed during the incorporation of Cr2O3 into the surface layer of SnO2.

53914 **APTIC NO. 77872**

Souten, David R., Charlotte J. Hopper, and Ronald L. Mueller

A CRITICAL REVIEW OF THE LOS ANGELES COUNTY APCD METHOD FOR SIMULATING ATMOSPHERIC OXIDANT BASED ON SMOG CHAMBER IRRADIATION EXPERIMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1975. 9 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-07.3.)*

A critical analysis of the Los Angeles County Air Pollution Control District s method for simulating atmospheric oxidant based on smog chamber irradiation experiments is presented. Several serious defects in the modeling procedure are apparent. The APCD methods used to characterize nitrogen oxides and hydrocarbons are unverified, and they ignore the effects of stationary emissions sources and many mobile sources on hydrocarbons and NOx. The APCD-characterized NOx ambient concentrations are significantly greatly than the measured ambient concentrations. The over-characterization of NOx ambient concentrations and the method used to relate maximum NOx concentrations and maximum hydrocarbon concentrations do not result in worst case oxidant predictions. The transform equation used in the APCD model is based on unsubstantiated relationships and an apparently arbitrary data fitting exercise. The transform neither conceptually nor quantitatively corrects for the problems associated with the chamber model.

53915 **APTIC NO. 78214**

Sreeramamurthy, R. and P. G. Menon

OXIDATION OF H2S ON ACTIVE CARBON CATALYST. *J. Catalysis, 37(2):287-296, May 1975. 19 refs.*

The air oxidation of hydrogen sulfide to sulfur on an activated charcoal catalyst was studied at temperatures between 65-100 C. The pattern of sulfur deposition on the catalyst was followed from changes in surface area, pore-size distribution, reactivity, and electron probe microanalysis. Sulfur was initially deposited in layers of over 20 sulfur atoms thick in the larger pores which accounted for about 70% of the catalytic activity. This was followed by a gradual filling of the micropores with a 4-atom thick layer of sulfur. The reaction was quantitative for removal of H2S from air and for recovery of sulfur. At temperatures above 120 C, the molten sulfur flowed down the catalyst bed and was tapped off, with the catalyst remaining active for days or weeks. The system was also found useful for following the advancing maxima in temperature profiles and rate profiles of a rapidly fouling catalyst bed for an exothermic reaction. (Author abstract modified)

53916 **APTIC NO. 77751**

Sterland, P. R. and M. A. Hollingsworth

AN EXPERIMENTAL STUDY OF MULTIPLE JETS DIRECTED NORMALLY TO A CROSS-FLOW. *J. Mech. Eng. Sci., 17(3):117-124, June 1975. 3 refs.*

The flow of air jets from a row of identical orifices equally spaced across the floor of a duct which carried an initially uniform airstream was investigated. As the pitch of the jets was increased, the rate of decay of the jet velocity increases steadily and the penetration of the jets, after initially decreasing, passes through a minimum at a pitch of about four orifice diameters and then increases. This minimum penetration is much less than that of a single jet. Circulation occurs in the lee of the jets when their pitch is less than about three orifice diameters, if the jet to cross stream momentum ratio is high enough. The amount of circulation increases as the jet pitch is reduced and as the momentum ratio is increased. (Author abstract modified)

53917 **APTIC NO. 78165**

Toby, Frina S. and Sidney Toby

THE REACTION OF OZONE WITH 1,3-BUTADIENE AND WITH ALLENE. *Intern. J. Chem. Kinet., vol. 1975:197-204, 1975. 9 refs. (Presented at the Chemical Kinetics Data for the Upper and Lower Atmosphere Symposium, Warrenton, Va., Sept. 15-18, 1974.)*

The reaction of ozone with 1,3-butadiene was studied in the absence and presence of added oxygen, and the reaction of O3 with allene was studied in the presence of O2. The temperature range was 0-70 C, initial O3 pressures ranged from 0.01 to 0.0 torr and diene pressures were 0.1-5 torr. The reaction with 1,3-butadiene is between one and two orders of magnitude faster than with allene under similar conditions. The rate constant for the addition of O3 to 1,3-butadiene is given by log (kl/M to the -1st power/sec) equals 7.8 + or - .5 (5800 + or - 800)/2.30 RT. Added oxygen slowed both reactions and the rate law was -d (concentration O3)/dt equals kl (concentration A) (concentration O3) plus k3 (concentration A)(concentration O3) to the 2nd power/(k4 + k5(concentration O2) where A is diene. Possible mechanisms are discussed in terms of the observed complex dependence of the O3 decay rate in the presence of dienes and the influence of added oxygen on these systems. (Author abstract modified)

53918 **APTIC NO. 78133**

Varkony, Thomas Haim, Shimeon Pass, and Yehuda Mazur

REACTIONS OF OZONE WITH SATURATED HYDROCARBONS. PHOTOCHEMISTRY OF OZONE-HYDROCARBON COMPLEXES. *Chem. Commun., vol. 17:709-710, 1975. 4 refs.*

The photochemical reactions of ozone with saturated hydrocarbons are described. Irradiation of solutions of O3 in saturated hydrocarbons with visible light results in products derived from the rearrangement of O3-hydrocarbon complexes. Irradiation with ultraviolet light leads to products derived from both the rearrangement of the complexes and the attack of oxygen(1D) atoms on the hydrocarbon. (Author summary modified)

53919 **APTIC NO. 78178**

Wadelin, Coe W. and Marion C. Morris

RUBBER. *Anal. Chem., 47(5):327R-333R, April 1975. 171 refs.*

The chemical analysis of rubber is reviewed and rubber s relationship to health and safety is discussed. A study of dust from highway traffic revealed that 1.5 to 2.5% of the particulate matter can be attributed to tread rubber. Methods for the identification, characterization, and determination of rubber covered include Raman and infrared spectrometry, differential scanning calorimetry, mass spectrometry, gel permeation chromatography (GPC). The GPC applications include determination of compositional and branching heterogeneity, quality control, and determination of branching mechanisms. The thermal properties and phase structure of rubber are discussed as well as determinations of polymers in polymer mixtures, halogens, oxygen, curing agents, age resisters, residual monomer, and carbon black. Traffic dust was separated by size, and particles larger than 7 micron contain 6.3% tread rubber, while those in the size range 1-7 micron contain 4.3% tread rubber. The material smaller than 1 micron was not analyzed for tread rubber.

53920 **APTIC NO. 78326**

Westenberg, A. A. and H. deHaas

RATE OF THE O + SO3 REACTION. *J. Chem. Phys., 62(2):725-730, Jan. 15, 1975. 18 refs.*

The rate of the oxygen and sulfur trioxide reaction was measured under pseudo-first-order conditions in a discharge flow reaction with electron spin resonance detection. The reaction is a fast third order process at pressures up to 7 torr. Third order rate constants obtained from M equals He at 298, 385, and 507 K are 7.3 + or - 0.2, 3.8 + or - 0.2, and 2.4 + or - 0.2 times 10 to the 17th power cm to the 6th power mole to the - 2nd power/sec, respectively. The data obey k equals 5.0 times 10 to the 16th power exp(785/T) in this range. At 298 K, the ratio k(M equals N2)/k(M equals He) is 1.4. The ratio k(M equals SO3)/k(M equals He) cannot be greater than 10. The reaction products are written as sulfur dioxide + O2. No evidence is found for a stable sulfur tetroxide in the gas phase. Analogous measurements on nitrogen + SO3 indicate it is too slow to measure by this technique. (Author abstract modified)

53921 **APTIC NO. 77765**

Yao, Yung-Fang Yu

THE OXIDATION OF CO AND C2H4 OVER METAL OXIDES. V. SO2 EFFECTS. *J. Catalysis, 39(1):104-114, July 1975. 16 refs.*

The kinetics of carbon monoxide and ethylene oxidation over cupric oxide, ferric oxide, manganese oxide, tin oxide, zirconium oxide, and copper chromate were investigated and compared with those over other metal oxides. The reactions are positive fractional order with respect to oxygen, CO, and C2H4 and inhibited by water to various degrees. Cobalt oxide, CuO, and CuCr2O4 have higher activity for both CO and C2H4 than the other oxides. The reduction in activity as a function of sulfur dioxide concentration in the gaseous phase and the reversibility of the SO2 effect was determined. The SO2 effect on C2H4 oxidation is less than that on CO. Cupric oxide and CuCr2O4 are more tolerant to SO2 than Co3O4, and are better candidates for oxidation catalysts for automobile emission control. (Author abstract modified)

1974

53922 **APTIC NO. 77814**

Andersen, Ib, Gunnar R. Lundqvist, and Lars Molhave

LIBERATION OF FORMALDEHYDE FROM PARTICLE BOARD UNDER CONTROLLED CONDITIONS IN A CLIMATE CHAMBER. *(Formaldehydafspaltning fra spanplader i klimakammer). Text in Danish. Ugeskr. Laeg., 136(38):2140-2145, Sept. 16, 1974. 13 refs.*

The liberation of formaldehyde from particle boards containing urea-formaldehyde glue was measured in a controlled climate chamber under various climatic conditions corresponding to variations which normally occur in dwellings. Formaldehyde liberation was twice the recommended upper value for air in dwellings at a temperature of 22 C, 35% relative humidity, and an air renewal of 0.5 times/hr. Liberation of H2CO increased with increases in temperature and humidity. Increased ventilation resulted in decreased H2CO concentrations and increased liberation of the compound.

53923 **APTIC NO. 75188**

Ando, W.

RECENT PROGRESS AND PROBLEMS IN THE STUDIES ON ATMOSPHERIC CHEMICAL REACTIONS. REACTIONS BETWEEN SO2 AND HYDROCARBONS. *(Taiki kagaku hanno kenkyu no saikin no shinpo to mondaiten. SO2-tanka suiso kei no hanno). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc Air Pollution), 9(2):95-104, Nov. 1974. 17 refs.*

Mechanisms of the formation of photochemical smog, photochemical reactions of sulfur dioxide in air, reactions of SO2-hydrocarbon- air systems, and the formation of aerosol by SO2 are discussed. Three main photoabsorptions of SO2 exist at 2300, 2900, and 3800 A; the intensity of absorption is 100:10:1. Of these absorptions, the first is not related to air pollution. The other two absorptions activate SO2 and cause photochemical smog. However, little has been studied so far on the mechanism of formation of sulfur trioxide from activated SO2. The deactivation rate of activated SO2 is dependent on the nature of the gases present with the activated SO2. For example, the deactivation rate is 0.1340 l/mole/sec times 0.0001 in the presence of butene-2, whereas the rate is 0.85 and 0.96/100,000,000 in the presence of nitrogen and oxygen, respectively. The deactivation by olefins is about 100-1000 times that by saturated hydrocarbons. It has been confirmed that the SO2 in the atmosphere is effective as a starter of the formation of peroxides, aldehydes, and ozone. It is also known that the presence of SO2 is effective in the formation of aerosols in air. Aerosols hardly form in the presence of nitrogen dioxide and hydrocarbons only; the presence of SO2 is vital to the formation of aerosols from these.

53924 **APTIC NO. 77903**

Ellsaesser, Hugh, W.

WATER BUDGET OF THE STRATOSPHERE. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 273-283, 46 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

Since upwelling of the Hadley cell constitutes the only significant known natural troposphere to stratosphere flux, stratospheric mass and mean residence time yield a reliable estimate of the Hadley flux through the tropical tropopause. This estimate, multiplied by the tropical tropopause cold trap saturation mixing ratio of 3.4 ppm for the water vapor influx and by the mean stratospheric mixing ratio of 2.5 ppm for the outflow, leads to an imbalance requiring a stratospheric sink specific for water vapor of about 3 times 10 to the 8th power tons/yr. Observational evidence indicates that the cold Antarctic winter stratosphere provides such a sink. (Author abstract)

53925 **APTIC NO. 78367**

Hajime, Akimoto

COMPUTER SIMULATION FOR PROPYLENE-NOX PHOTO-OXIDATIONS. *(Propylene-NOx kei sanka hanno ni taisuru keisanki). Text in Japanese. Tokyo Metropolitan Research Inst. for Environmental Protection (Japan), no. 3:297-305, March 1974. ABSTRACT*

The building of laboratory model of photochemical air pollution is described. The simulation model is based on the established velocity constant in the gas phase. In the simulation of the experimental curves of the smog chamber, the elementary reaction velocity constants are varied around the best value of those whose constants are not known. Propylene was used as the hydrocarbon. The model is based on a radical chain reaction. Computer time is about 40 seconds by HITAC 8700 computer. The case of varying the initial concentration of NO and propane to the same initial concentration of propane and NO are evaluated. The experimental data obtained in the smog chamber agreed with the model calculations.

53926 **APTIC NO. 78370**

Ishibashi, Y., H. Kojima, T. Masai, and S. Tsukahara

THE EFFECT OF AIR DISTRIBUTION IN A GAS TURBINE BURNER ON EXHAUST GAS CHARACTERISTICS, (I), STUDY THROUGH COMBUSTION EXPERIMENT AT ATMOSPHERIC PRESSURE. *(Gasutaabin nenshoki no kukiryobaibun ni yoru haikigasu tokusei eno eikyo, Dai-ippo Taikiatsu nensho jikken ni yoru kento). Text in Japanese. Preprint, Japan. Society of Mechanical Engineers, Tokyo, p. 139-142, 1974. 3 refs. (Presented at the Japan. Society of Mechanical Engineers, Combustion Symposium, 12th, Tokyo, Dec. 5-6, 1974.)*

In a study of the reduction of nitrogen oxides and carbon monoxide generated by a gas turbine burner, a series of experiments with the gas turbine model burner were conducted to determine burning and exhaust gas characteristics. The air quantity and NOx concentration was reduced to 30-35% when the excess air ratio was less than 1, but the CO concentration tended to increase. The NOx distribution and temperature distribution were calculated. The generation of NOx was affected by temperature.

53927 **APTIC NO. 78376**

Kato, Takio

GLOBAL TRANSITION OF THE DISTRIBUTION OF CHEMICAL SUBSTANCES: NEW METHODS OF TRAPPING AND ENVIRONMENTAL PURIFICATION. *(Kagaku busshitsu bunpu no gurobaru na suii: Atarashii toraekata to kankyo no seijokaho). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, 9p., 1974. 3 refs. (Presented at the Chemical Society of Japan Lecture Meeting on Global Environmental Science, Tokyo, Japan, July 8, 1974.)*

The natural standards for 43 trace elements in the atmosphere (e.g., Fe, 0.34 microgram/cu m; chlorine, 0.14 microgram/cu m; samarium, 0.000030 microgram/cu m), compiled by the Osaka Prefecture Central Radiation Research Institute are presented. The amounts of the elements present in the earth's crust are listed, as well as the amounts of elements dissolved in sea water. The amounts of natural pollutants (volcano emissions, dust, volatile oils from conifers) and industrial pollutants (sulfur and nitrogen oxides) in the atmosphere are indicated. The trace elements in the atmosphere, the earth's crust, the ocean, and their sources (soil, ocean, volcano, industrial pollution) are reviewed. A list of substances (pH 5.4-7.4; nitrogen trioxide, 0.15-2.47 ppm) found in 20 rivers in 7 prefectures in the northeast region of Japan during 1952-1955 is included. Naturalized plants in Japan, and the approximate time of their appearance are listed. About 800 varieties have been naturalized, according to 1972 data.

53928 **APTIC NO. 77868**

Mathias, Eckart, Engenio Sanhueza, I. C. Hisatsune, and Julian Heicklen

THE CHLORINE-ATOM SENSITIZED OXIDATION AND THE OZONOLYSIS OF C2CL4. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Rept. 304-73, 34p., Feb. 1974. 13 refs.*

The chlorine-atom initiated oxidation of tetrachloroethene both in the presence and absence of ozone was studied at 24 C and 32 C. The chlorine-atom initiated oxidation was a long-chain process similar to the ozonolysis of C2Cl4, with the two chain oxidations being inhibited by each other's oxidizing agent. In the presence of O3, the chain length of the product resulting from chlorine-atom initiated oxidation of C2Cl4 was reduced. A free radical mechanism is postulated for the reaction.

53929 **APTIC NO. 78144**

Ogasawara, N., T. Takagi, M. Daizo, T. Sen, and G. Sin

NITRIC OXIDE FORMATION IN TURBULENT FLOW GAS DISPERSING FLAME - ON FUEL NITRIC OXIDE. *(Ranrygasu kakusan kaen ni okeru NO seisei-Feul NO ni tsuite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo (Japan), p 123-126, 1974. 7 refs. (Presented at the Japan Society of Mechanical Engineers Combustion Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

The formation mechanism of fuel nitric oxide not only in the burning apparatus but in the flame by using a dispersing flame apparatus is described. Ammonia containing propane was used as a fuel N compound. Hydrogen cyanide and unreacted NH3 were measured in the inner part of the flame. The concentration distribution of NO, HCN and NH3 in the burning flame were measured. Fuel N was transformed to fuel NO via HCN, and even in the absence of fuel N, HCN detection and distribution forms were the same as those in the presence of fuel N. Fuel NO and NO production from the air occur via the same reaction mechanism.

53930 **APTIC NO. 77867**

Sanhueza, Engenio and Julian Heicklen

THE HG 6(3P)-PHOTOSENSITIZED OXIDATION OF C2CL4. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Rept. 306-73, 24p., Feb. 1974. 7 refs.*

The mercury-sensitized photolysis of tetrachloroethene both in the presence and absence of nitrous oxide and molecular oxygen was studied at 25 C. The only products for C2Cl4 alone were a polymer and mercury dichloride. A radical chain process occurred in the presence of O2, with the major products being the same as those from chlorine-initiated oxidation. The only difference between the two systems was that for Hg sensitization the quantum yields were proportional to the C2Cl4 pressure, whereas for chlorine-atom initiation there was no dependence on C2Cl4 pressure. A detailed mechanism based on chlorine-atom chain oxidation is presented, and appropriate rate constant ratios are evaluated. (Author abstract modified)

1973

53931 **APTIC NO. 77885**

Fron, Z.

MEASUREMENT OF THE FORCE BINDING A DUST LAYER WITH THE COLLECTING ELECTRODE OF AN ELECTROFILTER. *Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(2):43-53, 1973. 6 refs.*

NTIS: TT 73-54096/2

The theoretical bases are presented for measuring the resultant of forces binding a layer of dust with the flat surface of a collecting electrode of an electrofilter. For this purpose the phenomenon of free drop of a control plate covered with dust in an electrostatic field is considered. Theoretical computation of the force constituting the geometric sum of a series of component forces is not possible from a practical point of view. Studies were aimed at experimentally determining the resultant of forces acting upon a distributed layer of dust. First, the control platelets constructed over the collective electrodes of the electrofilter were covered with a layer of one of the three dusts used: metallurgical cement, sphalerite, and volatile dust. The platelet was then turned with the dust covered side facing downward, lifted to the required height at an angle to the level, and freely dropped. As a result of striking the beaters of the frame with the plate of the device, the layer of dust is suddenly decelerated, as a result of which part of the collected dust drops. The mass of dust removed and that remaining after shaking was determined on an analytical scale. A linear, inversely proportional dependence was found between the logarithm of the percentage of dust remaining and the logarithm of acceleration. The greatest binding forces are found at the end of the electric field. (Author abstract modified)

53932 **APTIC NO. 78354**

Jager, J.

BEHAVIOR OF POLYCYCLIC AROMATIC HYDROCARBONS ADSORBED ON SOLID CARRIERS. PART III. DECREASE OF POLYCYCLIC AROMATIC HYDROCARBONS ON CARRIER DURING THEIR EXPOSURE TO UV LIGHT AND SO_2. *(Chovani polycyklickych aromatickych uhlovodiku adsorbovanych na pevnych nosicich. Cast III. Ubytek polycyklickych aromatickych unlovodiku z nosice spolecnym pusobenim UV svetla a SO_2.) Text in Czech. Cesk. Hyg. (Prague), 18(2):59-65, 1973. 7 refs.*

The reaction of sulfur dioxide with pyrene adsorbed on alumina was investigated under different thermic and light conditions. The influence of various processes which take part in the decrease of polycyclic aromatic hydrocarbons from the carrier during illumination with ultraviolet light and the simultaneous action of SO_2 in a wide range of concentrations is discussed. The decrease of pyrene and 3,4-benzopyrene concentration in soot from domestic chimneys under the same conditions was studied.

53933 **APTIC NO. 78280**

Jotaki, Tomosada and Shinichi To

STUDIES FOR VELOCITY DISTRIBUTION OF A DUST-CONTAINING TURBULENCE JET. *(Ganjin ranryu funryu no ryusoku bunpu ni kansuru kento). Text in Japanese. Preprint, Society of Chemical Engineers, Japan, p. 61-62, 1973. 4 refs. (Presented at the Society of Chemical Engineers, Fall Meeting, 7th, Nagoya, Japan, Oct. 13-16, 1973.)*

The velocity distribution of a two dimensional, dust-containing turbulence jet was computed in initial and transitional regions, assuming that the motion of dust particles responds completely to the mean motion of the gas stream but not to the turbulence- changing velocity of the gas stream. By modifying the motion equation of a gas stream according to this assumption, an equation, -f(y)g(y) + g(y) (integration of g(y) from minus infinity to y) -h(y)/Q equals O was obtained, where y is y/x (x is the direction of gas stream), g(y) and h(y) are the first and second differentials of f(y), and Q is Ulx/lambda T(l + mn/zeta). Here Ul is a function of the mean velocity U, lambda T the coefficient of eddy viscosity, and mn/zeta the ratio of mixing. At the boundary conditions that f(y), g(y) and h(y) are 1, 0, and 0, respectively, at minus infinity of y and that f(y), g(y) and h(y) are 0 at plus infinity of y, the velocity distribution of the dust-containing jet was obtained from the above equation. The agreement of these calculations with the experimental results obtained by Laats was very satisfactory, not only for velocity distribution in tranverse cross section, but also for the absolute velocity of the jet in the section.

53934 **APTIC NO. 77866**

Luria, Menachem and Julian Heicklen

PHOTOLYSIS OF SO_2 IN THE PRESENCE OF FOREIGN GASES. VI. ACETYLENE AND ALLENE. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Rept. 330-73, 12p., Aug. 1973. 7 refs.*

The photolysis of sulfur dioxide in the presence of acetylene or allene was studied. Photolysis of SO_2 at 3130 A and 25 C in the presence of C_2H_2 led to the formation of carbon monoxide. In the presence of allene, CO and ethene were formed as gas phase products. For the C_2H_2 system, CO came from two non-emitting triplet states of SO_2 (57% from one SO_2 triplet and 43% from the other). In the allene system, two excited singlet states of SO_2 and possibly the emitting triplet state participated. (Author abstract modified)

EFFECTS-HUMAN HEALTH

1975

53935 **APTIC NO. 78380**

Aviado, Domingo M. and Miroslaw A. Belej

TOXICITY OF AEROSOL PROPELLANTS IN THE RESPIRATORY AND CIRCULATORY SYSTEMS. V. VENTRICULAR FUNCTION IN THE DOG. *Toxicology (Netherlands), vol. 3:79-86, 1975. 7 refs.*

The effect of aerosol propellants on the ventricular function in the dog was investigated. In concentrations of 2.5 and 5% the following cause depression: trichlorofluoromethane, trichlorotrifluoroethane, and trichloroethane. Three other propellants induce depression when administered in concentrations of 10 and 20%: octafluorocyclobutane, chloropentafluorethane, and difluoroethane. These three propellants do not exert a depressent effect on the force of contraction of a segment of the primate heart. There is no available propellant for aerosols that is devoid of cardiodepressant action. (Author abstract modified)

53936 **APTIC NO. 78028**

Bartocha, Wolfram

ON THE OCCURRENCE AND DISTRIBUTION OF BACTERIA IN WASTE WATER AEROSOLS. *(Zur Frage des Vorkommens und der Verbreitung von Bakterien in Abwasseraerosolen). Text in German. Forum Umwelthygiene, 1(6):148-150, 1975. 18 refs.*

The number of bacteria and the spreading of them in the environment by waste water aerosols from activated sludge plants, extended aeration plants, and trickling filters depends on wind velocity, relative humidity, solar radiation, bubble size, and the resistance of bacteria cells. The majority of aerosol particles have a diameter less than or equal to 5 millimeters. Particles of this size can be inhaled and retained by the human lung. At present, Enterobacteriaceae, Pseudomonaceae, and Bacillaceae have been identified in aerosols. Epidemiological investigations indicated that there are considerably more colds and flu cases among employees of waste water treatment plants.

53937 **APTIC NO. 78088**

Burton, J. L., F. J. Ensell, J. F. Leach, and K. A. Hall

ATMOSPHERIC OZONE AND FEMORAL FRACTURES. *Lancet, 1(7910):795- 796, April 5, 1975. 19 refs.*

The effect of the observed variation in the total ozone column at Oxford during the past 20 yr was investigated using the action spectrum for cholecalciferol synthesis. The effective monthly radiation dose is calculated by a computer program, making due allowance for the variation in solar zenith angle and the direct and indirect effects of cloud cover. The observed increase in O_3 are expected to decrease the annual ultraviolet radiations effective in the production of cholecalciferol in the skin by more than 20% in the past 20 yr. Cholecalciferol deficiency causes osteomalacia and lack of ultraviolet radiation is an important factor contributing to this disease in Britain. The decrease in cholecalciferol constitutes a significant hazard to the elderly population in terms of increased morbidity and mortality due to fractures of the femoral neck.

53938 **APTIC NO. 77949**

Chisolm, J. Julian, Jr.

SOURCES AND EFFECTS OF LEAD IN HUMANS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1975. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-18.5.)*

A review of sources and effects of lead in humans is presented. Although direct entry of significant amounts of lead into the body via the respiratory tract appears uncommon, particulate lead in dustfall provides a significant final common environmental pathway for entry of the metal into the body, particularly in young children. Lead exerts its adverse effects on hematopoietic tissue, the nervous system, and the kidney, with hematopoietic tissue being the first affected. Increased delta-aminolevulinic acid and coproporphyrin in urine and increased free erythrocyte protoporphyrin are the indicators of this critical effect of lead. (Author abstract modified)

53939 **APTIC NO. 78116**

Cinkotai, F. F. and D. W. Franklin

AN EVALUATION OF EFFECT OF AIRBORNE DUST FROM A COTTON MILL ON THE GUINEA-PIG ILEUM WITH REFERENCE TO BYSSINOSIS. *Brit. J. Ind. Med. (London), 32(3):239-243, 1975. 5 refs.*

The effect of airborne dusts on the guinea pig ileum was studied. Tyrode extracts of airborne dust collected freshly in the cardroom of a cotton mill and extracts of air pollutant samples drawn on the roof of the mill and of the local town hall were all found to induce the guinea pig ileum to contract when applied in a tissue bath. However, the force of contraction with air pollutants was greater than that with the cardroom dust. Considering the variables involved, the ileum response to the cardroom dust may have been due to ordinary air pollutants which constitute a significant part of the dust. The pharmacological phenomenon is probably not relevant in the context of byssinosis. (Author abstract)

53940 **APTIC NO. 77947**

Cortese, Anthony D. and John D. Spengler

DETERMINATION OF ENVIRONMENTAL CARBON MONOXIDE EXPOSURES THROUGH PERSONAL MONITORING--FIXED VS. PERSONAL AND TRANSPORTATION MODE RELATIONSHIPS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-31.5.)*

The relationship between residential location, commuting transportation mode, employment location and time weighted average human exposure to carbon monoxide in the metropolitan Boston area was investigated. The monitoring program consisted of 62 non-smoking volunteers each carrying the portable monitors for 3-5 day period during commuting and work activities. Automobile commuters are exposed to over twice as much carbon monoxide as commuters on rail mass transit. A small percentage of Boston automobile commuters are exposed to CO levels exceeding the national air quality standard of 35 ppm for 1 hr. Fixed location monitors significantly underpredict 1-hour personal CO exposures experienced during commuting in the Boston area. The only factors influencing personal exposure to CO during commuting are method of travel and exposure to cigarette smoke. The most effective strategies for reduction of both 1-hour and 8-hour exposures to CO are those requiring automobile emission control, system traffic flow improvement and those designed to decrease traffic volumes. (Author abstract modified)

53941 **APTIC NO. 75942**

Davies, John E.

OCCUPATIONAL AND ENVIRONMENTAL PESTICIDE EXPOSURE STUDY IN SOUTH FLORIDA (ANNUAL REPORT). *Miami Univ. School of Medicine, Fla., Dept. of Epidemiology and Public Health, Environmental Protection Agency Contract 68-02-1277, Program Element 1EA078, ROAP 21AYL, Rept. EPA-650/1-75-002, 89p., March 1975. 18 refs.*

NTIS: PB 243826/AS

Multiresidue analysis of urinary pesticide metabolites was used to assess occupational and environmental pesticide exposure in South Florida. A study of different degrees of human exposure to parathion revealed that diethyl phosphate (DEP), a metabolite of paroxon, was the most sensitive indicator of serious exposure. Concentrations of greater than 0.4 micrograms/ml were observed in the first urines collected from seven cases of poisoning with serious enzyme inhibition. In contrast, the only one urine from 71 sequential urines in parathion exposed workers exceeded the above concentration. The DEP/diethyl phosphorothionate thiophosphoric acid ratio was equally informative, with the mean ratio being 4.14 in 20 urines from the poison cases and 0.88 in urines from exposed workers. Excretion of metabolites for 91 days after the ingestion dichlofenthion was observed, emphasizing the significance of exposure to the less polar organophosphates in both acute and chronic instances. A variety of pesticides were identified in a regular air monitoring program in South Florida. (Author abstract modified)

53942 **APTIC NO. 78352**

El Ghawabi, Samir H., Mohamed A. Gaafar, Aida A. El Saharti, Soheir H. Ahmed, Kamelia K. Malash, and Rifki Fares

CHRONIC CYANIDE EXPOSURE: A CLINICAL, RADIOISOTOPE, AND LABORATORY STUDY. *Brit. J. Ind. Med. (London), 32(3):215-219, 1975. 26 refs.*

The effect of chronic cyanide exposure in the electroplating sections of three factories employing 36 workers was studied. The concentration of cyanides to which the works are exposed was measured. The regression line showing the relationship between thiocyanates in urine and the concentration of cyanides in the air is plotted. Increased percentages of hemoglobin and lymphocyte count were found in all exposed workers. Punctate basophilia was found in 28 workers. Cyanmethemoglobin is characteristic. Two men with psychosis similar to one case reported in therapeutic thiocyanate intoxication are found. Twenty of the workers have thyroid enlargements to a variable degree and consistency; in two it resembled lymphadenoid goiter. Thyroid 131 iodine uptakes at 4 and 24 hr are significantly higher than in the controls, while 131 PBI is unchanged. The reason for this iodine deficiency-like action is discussed. (Author abstract modified)

53943 **APTIC NO. 77699**

Finelli, V. N., M. Karaffa, M. Malanchuk, R. M. Danner, L. McMillan, and S. D. Lee

BIOLOGICAL EFFECTS OF EXHAUST II. EFFECTS OF CARBON MONOXIDE VS. WHOLE EMISSIONS FROM ENGINE WITH CATALYST. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-31.3.)*

The effectiveness of an oxidizing catalytic converter in eliminating or reducing in rats certain deleterious effects attributable to automobile emissions was confirmed. Some biological effects, such as elevation in hematocrit and hemoglobin and cardiac hyperthropy are due to carbon monoxide, but other effects such as loss in body weight and lung and/or kidney damage as shown by increased serum LDH, are due to other toxic components of auto emissions. The elevation in hematocrit and hemoglobin in rats exposed to various concentrations of CO are not due to dehydration but to a polycythemic response. The hematocrit and hemoglobin in all exposed animals gradually returned to normal levels. The animals exposed to exhaust emissions have a slightly higher serum triglycerides than controls. Serum cholesterol is not affected in these animals. There is a trend of lower serum cholesterol in the CO exposed animals. (Author abstract modified)

53944 **APTIC NO. 78238**

Grisler, R., A. Gobbi, Claudia Giavardi, Giuliana Caimmi, Raffaella Soverini, and Adriana Botta

VALUES OF HBCO IN 1000 INHABITANTS OF MILAN NON EXPOSED TO OCCUPATIONAL ABSORPTION OF CO. *(Valori di HbCO rilevati in 1000 abitanti di Milano non esposti all assorbimento professionale di CO). Text in Italian. Med. Lavoro (Milan), 66(1):37-49, 1975. 44 refs.*

Carboxyhemoglobin levels for 1000 non-occupationally exposed inhabitants of Milan were determined. The study group consisted of smokers and non-smokers; among the former, only individuals refraining from smoking for at least 10 hr were tested. The upper limit of the normal range for HbCO values among non-smokers was 2.85%, while among heavy smokers it was 4.59%. Heavy smokers also showed higher HbCO levels than did moderate smokers. Elevated HbCO values were also observed among residents living in carbon monoxide-polluted urban areas as compared with those living in unpolluted rural areas.

53945 **APTIC NO. 78285**

Imagawa, M. and S. Nagaoka

STUDIES ON THE EFFECTS OF AIR POLLUTION ON THE HUMAN BODY BY ANALYSIS OF SPUTA PART I. *(Kakutan-bunseki ni yoru taikiosen no jintaieikyo no kento). Text in Japanese. Tokyo to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 6:255-267, 1975.*

The results of seven studies are reported. Lysozymes in the sputum ranged from 0.56 to 10 mg/ml without specificity to diseases and with large daily individual variations. Sialic acid in the sputum ranged from 13.8 to 108.1 mg/ml with no disease specificity and with large daily individual variations. Cytological diagnoses of sputum in chronic obstructive lung diseases, especially chronic bronchitis and bronchial asthma showed a significant predominance of neutrocytes in the former. There was aggravation of the broncho-epithelial cells, histiocytes, and acidocytes in both diseases. The relationship between sputal viscosity in patients with chronic obstructive lung disease and mucopolysaccharides and fixation of acidic mucopolysaccharides was studied. There was a difference in mucopolysaccharidal metabolism on the wall of the airway between bronchial asthma, chronic pulmonary emphysema, and chronic bronchitis. Detailed cytological and histological observations of respiratory changes in rats which were caused by exposure to nitrogen dioxide of high concentration are discussed. The morphology of the histiocytes in the sputum of patients with chronic obstructive lung disease was studied, as well as fractions of phospholipid in the sputum. These studies suggest that sputum would be an important indicator of the effect of air pollution.

53946 **APTIC NO. 77640**

Keller, Martin D., Richard R. Lanese, Ralph I. Mitchell, and Roger W. Cote

A STUDY OF REPORTED RESPIRATORY ILLNESSES IN HOUSEHOLDS COOKING WITH GAS OR ELECTRICITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-09.5.)*

A survey of reported respiratory illnesses in households cooking with gas or electricity was conducted among 120 households with school age children. Reports of respiratory illness and symptoms were obtained by telephone interview every 2 wk for a period of 1 yr by a nurse-epidemiologist. When the onset of respiratory illness occurred within 3 days of the nurse's call, a household visit was arranged to examine the person reported ill and to obtain a throat culture. There were no differences in the incidence of respiratory illness among members of households cooking with gas or electricity; and, furthermore, the frequency of symptoms among the reported ill were evenly distributed among the two households. Data from the telephone interviews, examinations, and throat cultures supported the validity of the telephone interview method of determining incidence of respiratory illness. (Author abstract modified)

53947 **APTIC NO. 78355**

Kosmider, Stanislaw and Marek Chorazy

ELECTROLYTE DISORDERS IN CHRONIC EXPERIMENTAL POISONING WITH NITROGEN OXIDES. *(Zaburzenia electrolitowe w przewleklym doswiadczalnym zatruciu tlenkami azotu). Text in Polish. Patol. Polska (Warsaw), 26(1):47-53, 1975. 24 refs.*

The influence of chronic exposure of animals to nitrogen oxides in concentrations of 1 mg/N cu m on mineral disorders was investigated. The toxic action of NOx causes electrolyte shifts. Blood levels of sodium, magnesium, and chlorides drop, while calcium levels rise. Electrolyte disorders may cause a shift of water and swelling of cells and their organelles, as observed in poisoning with nitrogen oxides. The cause of transionization is connected with damage of cell membranes as a result of oxidation of unsaturated fatty acid with cholesterol, the main components of the membranes. (Author summary modified)

53948 **APTIC NO. 78305**

Law, F. C. P., J. C. Drach, and J. E. Sinsheimer

EFFECTS OF NITROGEN DIOXIDE AND 3-METHYLCHOLANTHRENE ON PULMONARY ENZYMES. *J. Pharm. Sci., 64(8):1421-1422, Aug. 1975. 11 refs.*

The effects on benzpyrene hydroxylase, phenol-O-methyltransferase, and catechol-O-methyltransferases were studied in guinea pigs after treatment with nitrogen dioxide by inhalation or 3-methylcholanthrene subcutaneous injection. Preparation of subcellular fractions of the lungs of sacrificed animals and assays of enzyme activities were carried out. The results were statistically analyzed. The 3-methylcholanthrene administration increased guinea pig lung benzpyrene hydroxylase activity about twofold. However, neither microsomal phenol-O-methyltransferase nor microsomal and supernatant catechol-O-methyltransferase activities were affected. None of the pulmonary enzyme activities was altered exposure to either nitrogen dioxide for 2 hr. (Author abstract modified)

53949 **APTIC NO. 77746**

Lawther, P. J.

POLLUTION BY CARBON MONOXIDE AND ITS EFFECTS. *Ann. Occupational Hyg., 18(1):89-90, 1975. 6 refs.*

Patterns of carbon monoxide pollution in the London streets were determined by continuous sampling. A micro technique of analysis requiring only 0.01 ml blood was developed to assess the effect on public health. Smoking was a more important factor in high blood concentrations of carbon monoxide in individuals than was automobile exhaust. The effects of carbon monoxide on perception and performance were tested under lab conditions for concentrations in the range of 8 to 10% in the blood. No convincing evidence of impairment was found. Apart from smoking, which may be the decisive factor in setting air quality standards, the relevance of carbon monoxide to public health may be in its effect on the cardiorespiratory systems of people already suffering from hypoxia due to diseases of heart or lungs.

53950 **APTIC NO. 77878**

Liu, Ben-Chieh

FUNCTIONS OF AIR POLLUTION DAMAGE ON HUMAN HEALTH. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 25 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-11.6.)*

A model for estimating both physical and economic damages resulting from various levels of air pollution in metropolitan areas of the United States with different social, economic, and demographic conditions is described. A Monte Carlo simulation technique is employed to randomly select samples from existing studies relating human mortality rate to sulfur dioxide pollution. A physical damage function of SO2 on human mortality is reconstructed, and the coefficient between the two variables is estimated via a predefined exponential mode with reciprocal transformation. Given this physical damage function, an economic damage function is developed and estimated by regression analysis of empirical data derived from metropolitan areas with an SO2 concentration level exceeding 25 micrograms/cu m. A 1.0% change in SO2 level is observed to result in a 4.7% change in the economic damage level according to computations performed for 41 metropolitan areas throughout the country. (Author abstract modified)

53951 **APTIC NO. 77810**

Menzel, Daniel B., Ronald J. Slaughter, Anita M. Bryant, and Hugo O. Jauregui

HEINZ BODIES FORMED IN ERYTHROCYTES BY FATTY ACID OZONIDES AND OZONE. *Arch. Environ. Health, 30(6):296-301, June 1975. 16 refs.*

A mechanism of ozone toxicity involving fatty acid ozonide intermediaries was investigated by studying the formation of Heinz bodies in human and mouse erythrocytes. Ozonides of the methyl esters of oleic, linoleic, linolenic, and arachidonic acids all produced Heinz body inclusions in human and mouse erythrocytes. No simple relationships between structure and activity were noted. Concomitant with Heinz body formation, methemoglobin and loss of cellular thiols were observed. Methyl ozonides readily oxidized gluthathione; and 1 mole of oxidized gluthathione was formed per mole of methyl oleate ozonide. Methyl ozonides catalyzed the formation of disulfide-linked interchain polymers between hemoglobin and ovalbumin. Heinz bodies were not produced with ozone in the absence of unsaturated lipids. Heinz bodies were observed in the blood of mice exposed to ozone (0.85 ppm) for 48 hr. Fatty acid ozonides appear to serve as toxic chemical species formed on ozone inhalation and may also explain the divergent protective effects of lipid antioxidants and thiol generating systems in vivo. (Author abstract modified)

53952 **APTIC NO. 77763**

Monster, A. C. and G. Boersma

SIMULTANEOUS DETERMINATION OF TRICHLOROETHYLENE AND METABOLITES IN BLOOD AND EXHALED AIR BY GAS CHROMATOGRAPHY. *Int. Arch. Occup. Environ. Health, 35(2):155-163, 1975. 9 refs.*

A gas chromatographic method for simultaneous determination of trichloroethylene (TRI), trichloroethanol (TCE), and trichloroacetic acid (TCA) in blood and TRI and TCE in exhaled air is described. The determination in blood is based on the relative volatility of TRI, TCE, and TCA methylester, which offers the possibility of headspace analysis. The gas chromatograph is equipped with an electron capture detector. Exhaled air, collected during 1 min normal breathing is analyzed for TRI and TCE under the same gas chromatographic conditions as the headspace vapor of blood. After exposure of 4 volunteers to 70 and 140 ppm TRI a close relation over a wide range between the concentrations TRI and TCE in blood and in exhaled air is obtained. The TRI and TCE concentration in blood is about 23 and 15,000 times higher respectively than in exhaled air. (Author summary)

53953 **APTIC NO. 78351**

Moore, W., D. Hysell, R. Miller, M. Malanchuk, R. Hinners, Y. Yang, and J. F. Stara

EXPOSURE OF LABORATORY ANIMALS TO ATMOSPHERE MAGANESE FROM AUTOMOTIVE EMISSIONS. *Environ. Res., vol. 9:274-284, 1975. 16 refs.*

Rats and hamsters were exposed 8 hr/day for 56 consecutive days to automotive emissions containing increased concentrations of manganese particulate which result from the use of a fuel additive, methylcyclopentadienyl manganese tricarbonyl (MMT). The exhaust gases were generated by using a 1972 Chevrolet 350 CID engine dynamometer system. The exhaust is diluted and the average concentration of Mn particulate in the irradiated animal exposure chambers is approximately 117 micrograms/cu m. No gross changes in general condition or appearance are observed in any of the animals. Microscopic examination of tissues from the animals show changes related to the exhaust emissions and no changes are found which are solely attributed to the presence of Mn or MMT. Concentrations of Mn in the tissues from exposed animals are generally elevated. (Author abstract modified)

53954 **APTIC NO. 78006**

Morita, M. and G. Ohi

PARA-DICHLOROBENZENE IN HUMAN TISSUE AND ATMOSPHERE IN TOKYO METROPOLITAN AREA. *Environ. Pollut., 8(4):269-279, July 1975. 13 refs.*

Samples of human adipose tissue and blood taken from residents in the Tokyo metropolitan area were analyzed for paradichlorobenzene. The agent, which is used extensively as a moth repellent and as a deodorant, is present in all 34 adipose tissues and adipose tissues and six blood samples. The chemical is present in ambient air samples taken in the center and suburbs of Tokyo. The level of p-dichlorobenzene in the fat is approximately equal to that of polychlorinated biphenyls which was determined with some of the same samples, and the concentration in the blood is three times higher than the polychlorinated biphenyls. (Author abstract modified)

53955 **APTIC NO. 77811**

Mouw, David, Kenneth Kalitis, Miriam Anver, Joyce Schwartz, Anna Constan, Rolf Hartung, Bennett Cohen, and Dan Ringler

LEAD. POSSIBLE TOXICITY IN URBAN VS RURAL RATS. *Arch. Environ. Health, 30(6):276-280, June 1975. 25 refs.*

Tissue lead concentrations were determined for 41 rats trapped in an urban area and 28 rats from a rural area. The rats were of both sexes and weighed between 200 and 550 g. Wild rats trapped in the urban area showed markedly elevated tissue lead levels in comparison with rural rats, particularly for the major lead- storage tissues, viz., bone and kidney (20-fold higher). The fecal levels were fourfold higher in urban rats, and the blood lead levels were about three times higher in urban as compared to rural rats. Lead concentrations in males and females within each group were not significantly different. There was no correlation between tissue lead concentrations and total body weights in either group. The elevated lead levels of urban rats were possibly due to factor affecting absorption of ingested lead or an elevated respiratory exposure to airborne lead and lead in precipitated dust, or perhaps both. Changes in several biologic indices (depression of delta-aminolevulinic acid dehydratase in kidney and red blood cells, the presence of renal intranuclear inclusion bodies, and increased kidney weight) confirmed lead poisoning in urban rats. (Author abstract modified)

53956 **APTIC NO. 77809**

Ramsey, J. M.

THE HEMATOLOGICAL EFFECTS OF CHRONIC, LOW LEVEL EXPOSURES TO CARBON MONOXIDE IN RATS. *Bull. Environ. Contamination Toxicol., 13(5):537-542, May 1975. 15 refs.*

The hematological effects of chronic, low level exposures to carbon monoxide were investigated using 150 post-pubertal, male albino rats divided randomly into an exposure group and a control group. The exposure group was placed in a chamber perfused with 250 ppm CO for 5 hr/day for 20 days. The mean percent saturation of blood with carbon monoxide (carboxyhemoglobin) was 23.4% for the exposed rats as compared with 1.02% for controls. Exposed rats also showed statistically significant elevations in red blood cell count, hematocrit, hemoglobin content, and reticulocyte percentage. However, during 10 postexposure days, the elevations showed significant reversibility. The mild polycythemia was evidently due to increased erythropoiesis since no significant change in plasma volumes occurred. The degree of polycythemia obtained was probably not critical with respect to increases in blood viscosity. (Author conclusions modified)

53957 **APTIC NO. 78317**

Rosmanith, Jindrich, Albert Schroeder, and Hans Joachim Einbrodt

EXAMINATION OF CHILDREN FROM A LEAD AND ZINC POLLUTED INDUSTRIAL AREA.

(Untersuchungen an Kindern aus einem mit Blei und Zink Belasteten Industriegebiet). Text in German. Forum Umwelthyg., 1(9):266-271, 1975. 38 refs.

Lead levels in the blood, urine and hair were measured in 400 randomly selected children living in an industrial area with lead, zinc and cadmium emissions were measured in an epidemiological study. The mean lead level in the blood was 16.7597 microgram/100 ml, while the lead levels in dry hair and in urine were 73.2377 microgram/g and 124.6945 microgram/liter. The delta aminolevulinic acid level in the urine averaged 3.4363 mg/g creatinin. The lead levels in blood and hair correlated with the lead concentration levels in the areas in which the children lived. The lead concentration in the hair increased with increasing blood lead levels, and a negative correlation was found between the blood lead level and the delta aminolevulinic acid excretion which decreased with decreasing urine lead level. The blood lead level was within the normal range, with values below 30 microgram/100 ml in 94% of all children. The blood lead levels were highest during summer. The very high blood lead levels during vacation in a non-polluted area are indicative of intensified lead elimination. The blood lead levels are higher in boys than in girls, but no age-dependence was observed. The absence of any correlation between the lead concentrations in blood and urine, and the negative correlation between the urinary lead level and the delta aminolevulinic acid excretion indicate increasing retention of lead with advancing age, and that the spontaneous excretion of lead and delta aminolevulinic acid is a function of lead retention rather than of actual exposure.

53958 **APTIC NO. 77847**

Rubino, R. A., L. Bruckman, A. Kramar, B. Keever, P. Sullivan, and B. Christine

POPULATION DENSITY AND ITS RELATIONSHIP TO AIRBORNE POLLUTANT CONCENTRATIONS AND LUNG CANCER INCIDENCE IN CONNECTICUT.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-31.1.)

The relationship between 1973 measured values of nitrogen dioxide, sulfur dioxide, and total suspended particulate matter and population density was investigated in Connecticut. High positive significant correlations are obtained for NO2 and total suspended particulate but the correlation coefficient is non-significant. Five year age adjusted lung cancer incidence rates were calculated and used to determine if a relationship between population density and lung cancer also existed. Small, but statistically significant positive correlations are obtained. The hypothesized lag period between exposure and cancer incidence does not manifest itself. The higher the population density of a given town, the higher its lung cancer incidence rate. The low, but signfificant correlation coefficients obtained indicate that population density has some effect on inducing lung cancer. Other factors such as neighborhood air pollutant levels are involved. (Author abstract modified)

53959 **APTIC NO. 77851**

Sanders, C. L., W. C. Cannon, D. M. Meier, and E. F. Blanton

PULMONARY CLEARANCE AND PATHOGENICITY OF INHALED HIGH-FIRED BERYLLIUM OXIDE. COCARCINOGENIC STUDY WITH 239PUO2.

In: Pacific Northwest Laboratory Annual Report for 1974 to the ERDA Division of Biomedical and Environmental Research. Part I Biomedical Sciences. Battelle, Richland, Wash., Pacific Northwest Labs. Biology and Medicine Rept. UC-48, p. 49-51, March 1975.

NTIS: BNWL-1950 PT1

The rapid impairment of alveolar macrophage function by phagocytized beryllium oxides was demonstrated in a study of pulmonary clearance of inhaled, high-fired BeO. The aerosolization of beryllium from newly ignited mantle-type camp lanterns indicates the possibility of widespread population exposure to BeO. High-fired BeO produces rapid functional damage to the alveolar macrophage, inhibiting its movement to the ciliated portions of the terminal bronchioles, resulting in the more prolonged retention of a test aerosol of 239 plutonium oxide. The significant impact of high fired BeO in the lung may not be so much the origin of beryllium disease as the significant impairment of pulmonary clearance to other inhaled toxic particulates to which the individual may be exposed.

53960 **APTIC NO. 77761**

Sarma, J. S. M., H. Tillmanns, S. Ikeda, and R. J. Bing

THE EFFECT OF CARBON MONOXIDE ON LIPID METABOLISM OF HUMAN CORONARY ARTERIES.

Atheroscler., vol. 22:193-198, 1975. 25 refs.

The effect of carbon monoxide on lipid metabolism of human coronary arteries was investigated. Human coronary arteries were perfused under sterile conditions in vitro with blood containing high or low concentrations of carbon monoxide. Lipid synthesis in the arterial wall was investigated by incorporating (14 carbon)acetate. Synthesis of the following lipids was measured: cholesterol, cholesterol ester, triglycerides, and phospholipids. Cholesterol uptake by the arterial wall was studied using (3 hydrogen)-cholesterol as a tracer. No influence of CO on lipid synthesis in the arterial wall is demonstrated. In contrast, arteries which are exposed to CO show a higher uptake of cholesterol as compared to their corresponding control. The concentration of CO in the perfusate does not alter the degree of cholesterol uptake. Carbon monoxide significantly increases the permeability of endothelial membranes. (Author summary modified)

53961 **APTIC NO. 78115**

Sato, Akio, Tamie Nakajima, and Yukiko Fujiwara

DETERMINATION OF BENZENE AND TOLUENE IN BLOOD BY MEANS OF A SYRINGE-EQUILIBRATION METHOD USING A SMALL AMOUNT OF BLOOD.

Brit. J. Ind. Med. (London), 32(3):210-214, 1975. 12 refs.

A gas chromatographic determination of benzene and toluene in blood with a small blood sample, 0.02 or 0.1 ml, is described. An aliquot of the blood sample in a sealed hypodermic syringe of 2 ml capacity is equilibrated at 37 C in a thermo-regulated water bath. After equilibrium is established, 1 ml of overlying air is submitted to gas chromatographic analysis. Stored human blood was used for preparing standard samples. Results obtained with a 0.1 ml blood sample and 2 ml syringe were compared with results obtained with a 1.0 ml bood sample and 16.5 ml vial. No significant difference was found. The method was used to test blood samples from men, rabbits, and rats exposed to benzene and toluene mixtures of various concentrations. (Author abstract modifed)

53962 **APTIC NO. 78394**

Schmeltz, Irwin, Dietrich Hoffmann, and Ernst L. Wynder

THE INFLUENCE OF TOBACCO SMOKE ON INDOOR ATMOSPHERES. I. AN OVERVIEW. *Preventive Medicine, vol. 4:66-82, 1975. 65 refs.*

Concentration levels of tobacco smoke constituents such as carbon monoxide, benzo(a)pyrene, and nicotine were measured in indoor public places and in laboratory controlled indoor environments. Carbon monoxide levels, depending upon room size, number of cigarettes or cigars/pipes smokes, and ventilation rates approach (if not exceed) the threshold limit value. In nonsmokers, passive inhalation of tobacco smoke results in slightly elevated carboxyhemoglobin levels and the appearance of nicotine in the urine. Animals chronically exposed to tobacco smoke develop lesions of the respiratory tract. Schoolchildren from smoking families are more prone to develop respiratory infections, as are one-year-old babies of smoking mothers. (Author abstract modified)

53963 **APTIC NO. 77752**

Schneider, Norman R. and Roger A. Yeary

NITRITE AND NITRATE PHARMACOKINETICS IN THE DOG, SHEEP, AND PONY. *Am. J. Vet. Res., 36(7):941-947, July 1975. 24 refs. (Presented at the American Veterinary Medical Association, Annual Meeting, Denver, Colo., July 1974.)*

Elimination kinetics of nitrite and nitrate in the dog, sheep, and pony were determined. The elimination half lives of nitrite are 0.499, 0.475, and 0.566 hr in the dog, sheep, and pony, respectively. Those of nitrate are 44.681, 4.233, and 4.821 hr. Apparent specific volumes of distribution (V d) of nitrite vary among the three species, 1623.7 ml/kg in dog, 278.0 ml/kg in sheep, and 191.6 ml/kg in the pony. The V d of nitrate was less varied, dog 238.5 ml/kg; sheep 291.1 ml/kg; and pony 209.3 ml/kg. In the in vitro studies on protein binding in canine plasma, the extent of nitrite protein binding varies directly with concentrations of 5-25 micrograms of nitrite/ml (4.5 to 13.6% bound), but inversely with concentrations of 50-100 micrograms of nitrite/ml (9.8 to 8.8% bound). Less than 1% of nitrate was bound to canine plasma at equimolar concentrations (5 to 100 micrograms of nitrate/ml). (Author summary modified)

53964 **APTIC NO. 77749**

Shirayeva, I. S., B. A. Markov, and S. G. Shmakova

GENERAL DIFFUSE CAPACITY OF THE LUNGS OF HEALTHY CHILDREN OF SCHOOL AGE IN STANDARD PHYSICAL LOADING. *(Obshchaya diffuzionnaya sposobnost legkikhuzdorovykh detey shkol nogo vozrasta pri standartnoy fizicheskoy nagrazke). Text in Russian. Vestn. Akad. Med. Nauk SSSR, no. 3:70-75, 1975. 19 refs.*

The general diffuse capacity of the lungs of 44 healthy schoolchildren was examined during rest and standard physical loading. A twofold increase in diffuse capacity was established during exercise as compared to the rest state. Diffusion values, both under loading and rest, were higher in boys (aged 13-16 yr) than in girls. The ratio of diffuse capacity to vital capacity of the lungs, however, did not depend on age or sex and amounted to an average of 11.5 + or - 0.742. Correlation analysis data for diffusion indices in relation to parameters of external respiration and physical development are also presented.

53965 **APTIC NO. 78052**

Tolos, William P., Donald E. Richards, and Lester D. Scheel

HISTAMINE INDUCTION AND RELEASE FOLLOWING PROTEOLYTIC ENZYME EXPOSURE. *Am. Ind. Hyg. Assoc. J., 36(4):272-277, April 1975. 12 refs.*

Histamine induction and release following the exposure of guinea pigs to a commercial proteolytic enzyme preparation containing 12% subtilisin in a mixture of other proteins and inorganic salts were investigated. The experiment involved pretreating three groups of guinea pigs with intradermal injections of saline solutions containing the commercial proteolytic enzyme, and alkaline protease preparation obtained from Aspergillus oryzae which was isolated from cotton dust, or a nonproteolytic mixture of proteins and lipases obtained from cotton seeds. The histamine content of the lung, liver, and ear tissues from guinea pigs which were pretreated with any of the preparations showed an increase or induction of histamine when compared with the tissue histamine levels of untreated animals. Following challenge by intratrachael injection of saline solution containing the subtilisin preparation, the guinea pigs pretreated with the same preparation showed a markedly reduced liver histamine level. Challenge by inhalation exposure to the subtilisin preparation resulted in a lower histamine concentration in the lungs and livers of guinea pigs that were pretreated with any of the above preparations. (Author abstract modified)

53966 **APTIC NO. 77786**

VanErt, M. and M. C. Battigelli

MECHANISM OF RESPIRATORY INJURY BY TDI (TOLUENE DIISOCYANATE). *Ann. Allergy, 35(3):142-147, Sept. 1975. 19 refs. (Presented at the American College of Allergists, Annual Congress, 31st, Miami Beach, Fla., March 22, 1975.)*

The pharmacological action of toluene diisocyanate (TDI) was measured in vitro using peripheral leukocytes of human blood. In this system TDI does not release histamine, but it contributes to the action of histamine and other mediators by moderating the beta-adrenergic function. Like propranolol, TDI reduces the cyclic AMP (CAMP) stimulation produced by cathecolamines. It differs from propranolol through its inhibition of the glucagon effect on CAMP (which propranolol does not possess) and also by inhibiting antigenic release of histamine. (Author abstract modified)

53967 **APTIC NO. 77762**

Vesterberg, Olof

GENERAL ASPECTS ON BIOTRANSFORMATION AND ELIMINATION OF ORGANIC COMPOUNDS IN CONNECTION WITH OCCUPATIONAL EXPOSURE. *Int. Arch. Occup. Environ. Health, 35(2):89-115, 1975. 69 refs.*

Common pathways for biotransformation (metabolism) of foreign organic compounds such as xenobiotics are reviewed. Uptake is influenced by work load. The type of and capacity for biotransformation is influenced by genetic background and can be increased by induction of capacity limiting enzymes and decreased by inhibition. Interferences with other chemicals, drugs and alcohol causes significant adverse effects. The rate of elimination is influenced by depots, degree of protein binding, and liver as well as kidney function. Arguments are presented for analysis of substances or biotransformation products and the use of biochemical limit values. (Author summary modified)

53968 **APTIC NO. 78082**

Warnock, Martha L. and Andrew M. Churg

ASSOCIATION OF ASBESTOS AND BRONCHOGENIC CARCINOMA IN A POPULATION WITH LOW ASBESTOS EXPOSURE. *Cancer, 35(4):1236-1242, April 1975. 20 refs.*

An association of asbestos and bronchogenic carcinoma was found in a population with low asbestos exposure. Quantitative counts of ferruginous bodies were performed on digests of lungs from 100 control and 30 lung cancer patients. The lung cancer group has significantly higher levels, although only 1 patient was occupationally exposed to asbestos. The distribution of asbestos bodies in the lungs of patients with carcinoma shows 18 or 60% (6 females and 12 males) have fewer than 10 bodies/g. Four males (13%) are in the intermediate 11-50 range, and 8 or 27% (1 female and 7 males) have counts above 50/g.

53969 **APTIC NO. 77774**

Wolf, A. Ford

OCCUPATIONAL DISEASES OF THE LUNGS. *Ann. Allergy, 35(3):165-171, Sept. 1975. 98 refs.*

Noxious gases, aerosols, or fumes are discussed which cause pulmonary diseases. The occupational sources and effects of the following pollutants are described: nitrogen oxides, sulfur dioxide, phosgene, polyurethanes, bakelite, cadmium, zinc chloride, zinc oxide, mercury fumes, manganese oxide, insecticides such as toxaphene and parathion, nickel carbonyl, inhaled lipoids, chloromethyl methyl ether, and perchlorethylene. Symptoms and effects of the disease and some case histories are given.

53970 **APTIC NO. 77760**

Zuskin, E. and F. Valic

CHANGE IN THE RESPIRATORY RESPONSE TO COARSE COTTON DUST OVER A TEN-YEAR PERIOD. *Am. Rev. Respirat. Disease, 112(3):417-422, 1975. 16 refs.*

Changes in respiratory function during a 10-year period were studied in a group of 34 men and 19 women exposed to coarse cotton dust. The prevalence of byssinosis increases significantly in the 10-year period both in men and women. There is an increase in the prevalence of all other chronic respiratory symptoms in 1973 compared to 1963. There is a significant decrease in forced expiratory volume in 1 sec and forced vital capacity over the Monday shift both in 1963 and 1973. In subjects who were without byssinosis in 1963 but who had developed it by 1973, there is a considerable decrease in forced expiratory volume in 1 sec in 1973. The mean annual decline of forced expiratory volume in 1 sec (70 ml) during the 10-year period in men is much greater than expected on the basis of the prediction equation for normal males, and it is most pronounced in those with byssinosis at the time of both surveys (111 ml). (Author summary modified)

1974

53971 **APTIC NO. 77806**

Andersen, Ib, Gunnar R. Lundqvist, Preben L. Jensen, and Donald F. Proctor

HUMAN REACTIONS TO AIR CONTAINING SULFUR DIOXIDE. *(Humane reaktioner pa SO2-holdig luft). Text in Danish. Ugeskr. Laeg., 136(38):2151-2158, Sept. 16, 1974. 26 refs.*

Nasal mucus flow rate, airway resistance, and sensation of discomfort were investigated in 15 young healthy volunteers during 6-hour exposures to either 1, 5, or 25 ppm sulfur dioxide. Following exposures to 5 or 25 ppm SO2, the nasal mucociliary function was significantly lowered, being most pronounced in the anterior part of the nasal cavity and in persons in whom the mucociliary function was initially slow. During nasal respiration, samples of pharyngeal air contained less than 1% of the inspired SO2 even after exposures to 25 ppm. Increased respiratory resistance was also observed after exposure to SO2, though no alteration in the closing volume occurred.

53972 **APTIC NO. 78090**

Bucci, G., P. Cenci, M. Mastella, L. Bonalberti, E. Kumer, A. Tuffanelli, and G. Zanella

PIGEONS AS AN INDEX OF ATMOSPHERIC LEAD POLLUTION IN FERRARA AND RO. *(I piccioni quale test biologico di valutazione dell inquinamento atmosferico da Pb richerche a Ferrara e Ro ferrarese). Text in Italian. Igiene Mod. (Parma), 67(20):129- 135, 1974. 7 refs.*

Using as their basis the study of rural and urban pigeons conducted by Tansy and Roth in the USA (1972), the authors tested 15 pigeons captured in Ferrara, Italy, and 15 others obtained from a small town in the same province, to determine possible accumulations of lead in their organs. There were significant differences between country and city in the erythrocyte levels of aminolevulinic dehydrase and the blood levels of lead, due to the greater volume of motor traffic in Ferrara. Determination of hematocrit and of the lead content of muscles, bones and feathers did not reveal any significant differences.

53973 **APTIC NO. 78134**

Fraumeni, Joseph F., Jr.

CHEMICALS IN THE INDUCTION OF RESPIRATORY TRACT TUMORS. *Cancer Epidemiol. Environ. Factors, vol. 3:327-335, 1974. 74 refs. (Presented at the International Cancer Congress, 11th, Florence, Italy, 1974, p. 327-335.)*

Research studies relating chemicals to the induction of respiratory tract tumors are reviewed. The major cause of respiratory cancer is cigarette smoking with inhalation of hydrocarbons and other chemicals. Industrial exposures account for only a small proportion of respiratory cancer in the population and include these chemicals: radiochemicals, mustard gas, asbestos, polycyclic aromatic hydrocarbons, chloromethyl methyl ether, bis(chloromethyl) ether, nickel, chromium, inorganic arsenic, iron ore, wood dust, isopropyl oil, and unidentified chemicals in the shoe industry. Non-industrial air pollution such as that produced by vehicular exhaust fumes is a suspected carcinogen. There are synergistic interactions between cigarette smoking and asbestos exposure, cigarette smoke and airborne radiation and sulfur dioxide and arsenic exposure.

53974 **APTIC NO. 78356**

Hayashi, Hisato

CYTOTOXICITY OF HEATED CHRYSOTILE. *Environ. Health Perspect., vol. 9:267-270, Dec. 1974.*

The cytotoxicity and hemolysis of mice to chrysotile and quartz were investigated. The biological activity of the surface is different between the two minerals. Quartz loses its cytotoxicity on heating over 500 C. Chrysotile shows remarkable toxicity and induced hemolysis on heating between 650 and 800 C, compared with the original unheated specimens. The mice injected intraperitoneally with minerals heated in this temperature range generally die within 48 hr after injection, while those injected with untreated chrysotile or chrysotile heated in the other heat ranges do not. The products in this range are highly disordered materials. The change of biological effects resulting from heat treatment is related to the disordered state of chrysotile in the process of transformation into forsterite. The relationship between chemical character and cytotoxicity of the heated chrysotile specimens was studied. (Author abstract modified)

53975 **APTIC NO. 78219**

Ionut, Carmen and H. Straus

CHANGES IN THE SEASONAL INCIDENCE OF SOME DISEASES UNDER THE CONDITIONS OF INTENSE POLLUTION OF THE URBAN ATMOSPHERE. *(Modificarea incidentei sezoniere a unor imbolnaviri, in conditiile poluarii intense a atmosferei urbane). Text in Rumanian. Clujul Med., 47(3):539-542, 1974. 7 refs.*

The seasonal incidence of disease over a 5-year period was studied in a heavily polluted urban area and in a relatively unpolluted control city. Certain diseases in both adults and children showed a characteristic seasonality in the control city. In the polluted area, acute respiratory infection and acute bronchitis did not show their known characteristic seasonal trends, suggesting that air pollution altered the normal incidence of these diseases.

53976 **APTIC NO. 78265**

Katou, Tatsuo, Yoshimichi Hanai, Yoshiyuki Horimoto, and Hironori Kachi

ANALYTICAL STUDY OF SUBSTANCES RELATED TO PHOTOCHEMICAL SMOG AFFLICTION. *(Kokagaku sumogu higai genin bushitsu ni kaimei ni kansuru kenkyu). Text in Japanese. Yokohama Kokuritsu Daigaku Kankyo Kagaku Senta Kiyo (Bull. Inst. Environ. Sci. Technol., Yokohama Nati. Univ.), 1(1):37-53, 1974. 4 refs.*

As the result of chromatographic and chromatograph-mass spectrometric analysis of air samples collected in southwestern Tokyo, acrolein and methyl nitrate were found to be closely associated with photochemical smog afflictions. Acrolein is known to cause eye irritation, while methyl nitrate causes dilation of veins, blood pressure and other circulatory disorders. The behavior of hydrocarbons in automotive exhaust gases, attributed to oxidant formation was investigated experimentally. Analyses of automotive exhaust gases indicated an extremely high concentration of toluene which was attributed to the use of modified gasoline with high octane value. In the photochemical reaction of automotive exhaust gases, the reaction products identified were carbonyl and nitrogen compounds (acetone, acrolein, methyl nitrate, ethyl nitrate, nitromethane, peroxyacetyl nitrate, nitroethane), with methyl nitrate concentration being the highest. In the photochemical reaction of toluene with nitrogen oxides, methyl nitrate, acrolein and acetone were produced. The formation of 3-carbon compounds from toluene strongly indicates a new type of aromatic ring opening reaction. The reaction mechanism is not yet clearly understood.

53977 **APTIC NO. 77797**

Kawai, K., K. Nozaki, and H. Kyono

EXPERIMENTALLY INDUCED BRONCHITIS AND PARTICULATE MATTER. (EXPERIMENTS ON INHALATION OF HEAVY OIL COMBUSTION PRODUCTS. REPORT NO. 4). *(Jikkenteki kikanshien to ryushijo busshitsu. (Juyu nensho seiseibutsu kyunyu jikken. Dai-4-ho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):343, Nov. 1974. (Presented at the Japan Society of Air Pollution National Meeting, 15th, Paper 198.)*

The significance of particulate matter in experimentally induced bronchitis in rats is described. Particulate matter (carbon) is attached to the outer membrane, and its soluble components appear within the cells. Rats were exposed for 32-915 days to a polluted atmosphere formed from heavy oil combustion products. The average amounts of the pollutant components for a 40-month period were: sulfur dioxide, 18.08 ppm; carbon monoxide, 35.45 ppm; nitrogen oxides, 3.85 ppm; and particulate matter, 6.3 mg/cu m (0.1-2 micron, of different shapes). Chemical analysis of accumulated soot directly in front of the inhalation box showed the presence of acidity (3.02 mcg/gr), sulfate (0.32 mmol/gr), vanadium, and other heavy metals. The rats developed various stages of respiratory ailments similar to human ailments: laryngitis; tracheal bronchitis; bronchitis in the finer passages of the bronchial tubes; black lung; black lung of the lymph nodes in the pulmonary; irritation of the alveolar membranes; initial stages of emphysema; and irritation of lung fibers. Laryngeal and bronchial ailments occur first; bronchitis of the fine tubes near the alveoli is indicative of lung involvement for the second half of exposure. When particulate matter is removed from heavy oil combustion products, gaseous components alone caused very slight changes in the mucous membranes of the air passages. Respiratory ailments were nearly completely suppressed for the lifetime of the rats. Carbon particulates in the respiratory tracts of the rats were found mostly in alveolar phagocytes, alveolar cavities, and bronchial cavities. Similar carbon particulates were also found on the outside membranes of I-type alveoli and bronchial tubes. The decrease in sulfur and vanadium content of these carbon particulates was determined by X-ray microanalysis. Electron microscope photographs and X-MA tracings are included.

53978 **APTIC NO. 78155**

Krishnan, B. and T. K. Nambinarayanan

EFFECT OF SULPHURIC ACID FUMES ON LUNG SURFACTANT. *Indian J. Exp. Biol., 12(6):524-527, Nov. 1975. 26 refs.*

The effect of fumes from fuming sulfuric acid on the lung surfactant in rats was investigated by measuring the maximum and minimum surface tension and estimating the phospholipid content of the lung homogenate. There is a significant increase in the surfactant activity when the rats are exposed to the fumes at an average concentration of 703 ppm for 6 days at 5 hr/day, but the activity decreases when they are exposed for 5 wk. Short term exposure leads to increased secretion of surfactant material by mild irritation, while long term exposure inhibits the production. The data are useful in determining the mechanism of respiratory diseases due to air pollution. (Author abstract modified)

53979 **APTIC NO. 77988**

Lunan, Kenneth D., Ted A. Jorgenson, and George M. Goldstein

LEAD AND CADMIUM INHIBITION OF DNA BIOSYNTHESIS. *Preprint, Stanford Research Inst., Menlo Park, Calif. and Environmental Protection Agency, Research Triangle Park, N. C., 3p., 1974 (?).*

The biochemistry of leukocytes derived from peripheral blood of rabbits treated with lead or cadmium salts was examined. Rabbits were injected daily for 7 or 21 days with saline, 10 mg/kg lead acetate, or 1 mg/kg cadmium chloride. Leukocytes were isolated from the rabbits blood. Aliquots of cells were incubated with 3H-thymidine, 14C-uridine, 3H-leucine, and 14C-choline. The lead and cadmium treatments only marginally influenced the blood values. The outstanding metabolic result was a 6.5 and 3.3 fold depression of 3H-thymidine incorporation in the one and three week cadmium treated animals, respectively. The 14C-uridine incorporation was depressed 1.7 and 2.5 fold at the same time. Lead and cadmium treatments did not affect the incorporation of 3H-leucine and 14C-choline or the depletion rate of leucine. Choline depletion was accelerated slightly after three weeks of treatment with either metal. The energy dependent biosyntheses of protein and phospholipid were unaffected by lead and cadmium treatment suggesting that energy metabolism and oxidative phosphorylation were not affected appreciably. The depressive effect of these metals on DNA synthesis may result from a direct interaction with DNA causing a disruption of the replicative process. Leukocytes are a responsive bio-indicator of lead and cadmium intoxication.

53980 **APTIC NO. 78318**

Misiewicz, Adam

SOME BIOCHEMICAL AND IMMUNOLOGICAL DISTURBANCES CAUSED BY CHRONIC EXPOSURE TO NITROGEN OXIDES. *(Niektore zaburzenia biochemiczne i alpornosciowe w przewleklym narazeniu na tlenki azotu). Text in Polish. Polski Tygod. Lekar. (Warsaw), 29(19):801-803, 1974.*

The biochemical and immunological aspects of prolonged exposures to nitrogen oxides was investigated by research and clinical tests. The research involved a group of 30 hamsters who were exposed to daily doses of 1 mg/cu m NOx for 8 hr a day during 120 days. The clinical investigation involved a group of 30 men, aged 26 to 40, who had been exposed on the job for 5-10 years to concentrations of NOx ranging from 1.58-7.0 mg/cu m. All subjects were questioned on chronic bronchitis and on frequency of infectious diseases during the past 3 yr. The chest cavity was examined physically, cardiologically and radiologically. The urine and the blood were analyzed in detail. Statistical analysis of 40 parameters showed that prolonged exposure to NOx damages respiratory organs (resulting in chronic bronchitis, emphysema and other diseases), lowers the natural immunity mechanisms of the body which results in an increased risk of infection of respiratory organs, has no tangible effect on immunologically function, damages liver cells, causing metabolic changes that are most pronounced in case of lipoids, proteins and gylcoproteins. Also, depending on concentration and length of exposure, NOx can either accelerate or decelerate erythropoesis.

53981 **APTIC NO. 78081**

Muir, David C. F.

TOBACCO SMOKE INHALATION. *Scand. J. Resp. Dis. (Copenhagen), 91:44-46, 1974. 9 refs.*

Mechanisms by which environmental tobacco smoke aerosol enters and deposits in the respiratory tree are described. The amount of particulates deposited in the lung and the sites of its deposition depends on the size of the particles, on the rate and depth of breathing, and on whether it is inhaled through the mouth or nose. The person exposed to environmental tobacco smoke inhales smoke distributed throughout the tidal air and by nasal breathing. The particles do not penetrate to the same depth as during smoking and a large fraction is filtered out in the nose. The efficiency of this nasal filtration depends on the size of the particles. Subjects with impaired ventilatory capacity to airway obstruction have a greater than normal intrapulmonary deposition of inhaled particles, but the site of deposition is shifted proximally.

53982 **APTIC NO. 78017**

Oomichi, Sadao and Hiromasa Kita

EFFECT OF AIR POLLUTANTS ON CILIARY ACTIVITY OF RESPIRATORY TRACT. *Bull. Tokyo Med. Dent. Univ., 21(4):327-343, 1974. 19 refs. (Presented at the Japanese Society for Hygiene, Annual Meeting, 44th, Nagasaki, Japan, April 1974.)*

The influence of sulfur dioxide, nitrogen dioxide, nitric oxide, formaldehyde, and ozone on the ciliary activity of excised guinea pig trachea specimens was studied. A new system consisting of a phase-contrast microscope, a photoelectric cell, an oscillograph, and an exposure chamber was used to assess ciliary activity in terms of beat rate. Half reduction times in ciliary activity at a gas concentration of 50 ppm were: 4 min, 5 min, 10 min, 14 min, and 20 min for SO2, H2CO, NO2, NO, and O3, respectively. The stronger influence of water-soluble gases such as SO2 and H2CO on ciliary activity as compared to less water-soluble gases was due to the fact that the latter gases passed over the mucous surface of the upper airway without dissolving in the mucous layer in contrast to water-soluble gases which did dissolve in this layer. (Author abstract modified)

53983 **APTIC NO. 78216**

Ozarslan, Saime

HISTOLOGICAL INVESTIGATIONS ON THE EFFECTS OF INHALATION OF TETRAETHYL-LEAD VAPORS. *Istanbul Univ. Fen Fakultesi Mecmuasi Ser. B., 39(1 and 2):9-15, 1974. 17 refs.*

The effects of tetraethyl lead vapor inhalation on the liver, lung, and kidney of male and female albino rats (7-weeks-old) was investigated under conditions typical of working exposures for a period of 27 days (8 hr/day). Marked atrophy of the liver lobules was observed along with degeneration and a decrease in the number of cells of this structure. The nuclei of certain parenchymal cells were not distinguishable, and most of the nuclei in these cells were pyknotic. Ectasia and congestion were prominent at the central veins. There was also an obvious increase in the dimensions of the sinusoidal spaces. In many regions the concentric zones, especially around the central vein, were irregularly arranged and interrupted. In the lung the alveolar epithelium was destroyed in many places, and a large number of blood cells were scattered togehter with some pulmonary epithelial and alveolar cells in the alveolar sacs. Most of the erythrocytes showed obviously punctured features. There were many vascular lesions in different regions of the kidney, and the capsule was seriously damaged. Parenchymatous dystrophy and basic damage to the glomerular apparatus were observed along with a prominence of tubular lesions. (Author abstract modified)

53984 **APTIC NO. 77632**

Roganov, V. F. and N. I. Roganova

HEMOSTASIS IN PERSONS AFFECTED BY CHLORINATED HYDROCARBONS. *(Gemostaz u lits, podvergayushchikhsya vozdeystviyu khlorirovannykh uglevodorodov). Text in Russian. Kazan. Med. Zh., no. 1:88-89, 1974. 1 ref.*

Results of hematological investigations of 77 workers exposed to trichlorobenzene, hexachlorobenzene, pentachlorophenolate, and sodium pentachlorophenolate in a fertilizer plant are presented. Progressive thrombocytopenia, increased percentage of aged, atypical, and involuted thrombocytes, and reduced agglutinability of the blood platelets were demonstrated. Hemorrhagic syndrome was found in 6.1% of the workers. These persons showed reduced blood clotting activity, increased clotting time, increased plasma recalcification time, reduced heparin tolerance of the plasma, reduced thrombokinase and increased antithrombokinase activity, reduced factor VII concentration, reduced fibrinase activity, reduced prothrombin time, increased fibrinogen concentration, and reduced antithrombin activity. Accelerated fibrinolysis was also observed in these workers.

53985 **APTIC NO. 78152**

Sasai, A.

STUDIES ON THE RELATIONSHIP BETWEEN THE CONTENT OF CARBON MONOXIDE IN ATMOSPHERE AND THE HEALTH OF MOTHERS AND BABIES PART 1. THE STATUS OF CARBON MONOXIDE CONCENTRATION IN EXPIRED AIR OF PREGNANT WOMAN AND ITS RELATIONSHIP TO ENVIRONMENTAL AND PHYSICAL FACTORS. *(Taikichu issankatanso nodo to boshi no kenko to no kanren ni kansuru kenkyu. Dai 1-po. Ninpu no kokichu CO nodo no jittai to kankyo yoin oyobi shintai yoin to no kanren). Text in Japanese. Minzoku Eisei Human Hyg.), 40(2):37-60, March 1974. 39 refs.*

The actual condition of carbon monoxide content in expired air and its relation to life-environmental and physical factors was investigated in 277 pregnant women. Subjects residing in a midtown area of Tokyo have average CO concentrations in the expired air slightly higher than those previously reported. Seventy two women (26%) have CO concentrations over 10 ppm. The concentration of CO in expired air correlates with the CO level in the immediate life environment of the individual. Pregnant women with a history of abnormal gestation and/or abnormal delivery are more frequent in the areas with those exhibiting higher CO concentrations in expired air, compared to regions with women showing lower CO levels.

53986 **APTIC NO. 78397**

Smulevich, V. B. and M. A. Bulbulian

QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL POLLUTION BY CANCEROGENIC SUBSTANCES: ONE STAGE IN THE EPIDEMIOLOGICAL STUDY OF TUMOURS. *Int. J. Epidemiol., 3(4):321-333, 1974. 17 refs.*

A sample of Moscow passenger transport drivers working conditions of high atmospheric pollution was investigated. A quantitative assessment was made of the characteristics of various factors in their working environment. The atmosphere in the driving cabins of motor and trolley buses, and some factors involved in the organization of drivers work were investigated. Benzo(a)pyrene is in all of the samples of air collected in the cabins. The levels are higher in motor than in trolley buses. When the cumulative benzo(a)pyrene dosage to which the drivers are exposed during an average working day is calculated, it is considerably below the maximum acceptable dosage. (Author abstract modified)

53987 **APTIC NO. 78142**

Sugawara, T.

ON THE RELATIONSHIP BETWEEN RESPIRATORY RESISTANCE OF OSAKA PRIMARY SCHOOLCHILDREN AND AIR POLLUTION, PART 2. *(Osaka-shi gakudo no kokyuteiko to taikiosen tono kanren ni tsuite dai 2 ho). Text in Japanese. Infantile Respiratory Diseases Res. Meet., 7th, Japan, 1974, 14p. (Nov. 17, Paper No. 6.)*

Respiratory resistance was determined in 2377 primary schoolchildren in Osaka City, including control children in Takarazuka City, by respiratory resistometer. The average value of respiratory resistance decreased remarkably from that of the preceding year. However, the value was significantly higher than that in children in a control school in Takarazuka City. Some values decreased, in comparison to the control school. However, the rest showed higher values than the control, although their values were lower than those of the preceding year.

53988 **APTIC NO. 78022**

Tsutsumi, M.

COMPLAINTS AND PATHOLOGY OF INHABITANTS OF AIR-POLLUTED DISTRICTS. *(Taiki osen chiku jumin no uttae to sono byotai). Text in Japanese. Nihon Iji Shimpo (Japan. Med. J.), no. 2625:27-31, Aug. 1974. 25 refs.*

The otorhinolaryngological findings from examinations of 2000 children of ages 6 to 18 yr in an air-polluted district of Tokyo were compared with findings on children in a non-air- polluted district. The ratio of positive responses to intracutaneous injection of house dust and ragweed extracts was 27-45% in those of air polluted districts, and 22-35% in those of children in a non-air-polluted district. The ratio of positive responses to a nasally-inserted allergen disc was 29.0%, about two times larger than the 12.8% in the non-air-polluted district. The ratio of those who had a positive reaction to the two tests was 72.1-80.2% in the air-polluted districts, about two times larger than the 45.7% in the non-air-polluted district. The morbidity of paranasal sinusitis in the first group of children was about 20% as compared to 9% of those in the non-air-polluted district. Based on these findings, another investigation was carried out in 1974 on 153 people in a district where sulfur dioxide, nitrogen dioxide, and nitric oxide concentrations were, on the average, 0.2-0.4, 3.0-5.0, and 3.0-6.0 pphm. Twelve out of 27 persons had nasal diseases. Only 23 persons had no nasal diseases out of 109 persons who complained of pharyngeal pain. The ratio of positive responses to allergens was 64.8%. The morbidity of nasal diseases was 64.7% in those with nasal complaints, and 87.0% in those with nasal and pharyngeal complaints. Polluted air at first produced inflammatory changes in the mucosa of the nasal cavity. The most frequent complaint, throat pain, was accompanied by nasal and paranasal sinusitis. The average degree of air pollution around Tokyo could be prevented by the normal cleaning function of the nasal cavity.

53989 **APTIC NO. 77789**

Wagner, J. C.

MESOTHELIOMAS. *Cancer Epidemiol. Environ. Factors, vol. 3:323- 326, 1974. 8 refs. (Presented at the International Cancer Congress, Florence, Italy, 1974.)*

Epidemiological evidence for associating exposure to asbestos dust with the development of diffuse mesotheliomas of the pleura and peritoneum is reviewed. There is a definite association between exposure to the dust of the crocidolite asbestos from the Cape mines and the development of diffuse mesotheliomas. There is evidence of these tumors occurring among people with environmental, or domestic exposure. There is no evidence to confirm that there is a risk to the general public from the occasional asbestos fibers to which they may be exposed. Diffuse mesotheliomas can occur without exposure to asbestos dust. (Author conclusions modified)

53990 **APTIC NO. 78154**

Yoshida, R., K Hayashi, and K. Motomiya

EXPERIMENTAL STUDY OF THE EFFECT OF AIR POLLUTION ON THE ONSET OF BRONCHIAL ASTHAM. *Chiba Daigaku Kankyo Kagaku Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), vol II:15-19, 1973 and 1974. 10 refs.*

The effect of exposure to nitrogen dioxide and to ozone on the histamine content in the lung and on the production of reaginic antibody was investigated in animals. Guinea pigs and rats were sensitized with inhalation of 2% ovalbumin prior to exposure to 10 ppm NO_2 or 1 ppm O_3. The histamine level in the lungs of animals exposed to NO_2 was 50% lower than in controls and significantly decreased in the lungs of animals exposed to O_3. Animals that inhaled the antigen three times, were injected with the adjuvant three times, and were exposed to NO_2 three times had the highest antibody production rate and a high antibody titer. Reaginic antibody titers of not less than 64 times were detected in nine animals out of 10.

53991 **APTIC NO. 78169**

Yoshida, R., K. Motomiya, T. Adachi, and S. Funabashi

PREVALENCE STUDY OF BRONCHIAL ASTHMA IN SCHOOLCHILDREN IN AIR POLLUTED AREAS IN JAPAN. *Rep. Environ. Res. Organ. Chiba Univ., vol. 2:21-25, 1974. 4 refs.*

A prevalence study of bronchial asthma in schoolchildren in air polluted areas in Japan was conducted. The method consists of primary screening with questionnaire, secondary screening with interview, and tertiary screening with allergological examinations. In surveys in Fuji in 1970, Chiba Prefecture in 1972 and 1973; and in Tokyo in 1971 and 1972 the prevalence rate of bronchial asthma in schoolchildren is higher in the air polluted area than in the non-polluted areas. The prevalence rate in the non-polluted area is 1%, whereas that in the air polluted area is roughly twice as much.

53992 **APTIC NO. 78025**

Yoshida, Y.

INFANTILE AIRWAY DISEASES DUE TO AIR POLLUTION AND INFECTION. *(Taiki osen to kansen no shoni kido-kei byohen). Text in Japanese. Nihon Kikan Shokudo-ka Gakkai Kaiho (J. Japan. Broncho-Esophagolog. Soc.), 25(4):164, Sept. 1974. (Presented at the Japan. Broncho-Esophagological Society, Annual Meeting, 26th, Hirosaki, Japan, Sept. 7-8, 1974.)*

According to the results of investigation on the subjective respiratory symptoms of bronchitis, chronic bronchitis, and bronchial asthma, in 55,513 pupils in a polluted area (A) and in 34,295 pupils in a relatively unpolluted area (B), both in Tokyo, the respective percentages were 18.7, 2.1, and 2.6% in A and 10.3, 1.7, and 2.5 in B. There was a greater frequency of increased resistance among pupils in the polluted area. To analyze the recent trend of chronic, protracted symptoms of infantile bronchitis, bronchial biopsies were performed and the pathohistological states were classified into five types: proliferation of ciliary cells (1), mucin-producing (2), combination type of (1) and (2), regeneration of epithelial cells, and ablation of epithelial cells. In cases of infantile bronchial asthma, the proliferation and regeneration of mucus epithelial cells was apparent and in all cases of infantile chronic bronchitis there was ablation of epithelial cells. Infantile chronic and repeatedly-occurring bronchitis showed a tendency to heal or improve. Electronmicroscopic observation of the bronchial mucus membrane of young and old rabbit revealed smaller goblet cells, incomplete development of cilia, no apparent proliferation of epithelial cells, and the absence of collagen fibers in sub-mucosal tissue in younger rabbits. The results of experiments of the exposure of young and old rabbits to gaseous stimulants was described in connection with infantile chronic bronchitic symptoms.

1973

53993 **APTIC NO. 78024**

Harada, K., T. Kurihara, T. Okamoto, and M. Ozaki

SURVEY AND RESEARCH REPORT ON MEDICAL EXAMINATION METHOD OF POLLUTION-CAUSED ILL HEALTH BY COMPUTERS. *(Konputa ni yoru kogai kenshi sisutemu ni kansuru chosa kenkyu hokokusho). Text in Japanese. In: Survey and Research Report on Medical Examination Method of Pollution-Caused Ill Health), Kyushu Environmental Management Assoc., Fukuoka (Japan), p. 155-213, March 1973. 27 refs.*

An environmental control system based on systematic measurements, forecasting, and health effects, following an exhaustive study on various models, is described. The system consists of three levels of computers. The C-level computer acts as the monitoring center, while the B-level computer does on-line forecasting (fed with the data from the C-level computer). The A-level computer, equipped with data base, and stores all data from the B-level computer, which can be read on equipment installed in government offices and research institutions. It can make large-scale calculations, analyze pollution mechanisms, estimate pollution-related illness, develop forecasting models, and carry out various simulations.

53994 **APTIC NO. 77912**

Lave, L. B. and L. C. Freeburg

HEALTH EFFECTS OF ELECTRICITY GENERATION FROM COAL, OIL, AND NUCLEAR FUEL. *Nucl. Safety, 14(5):409-428, Sept.-Oct. 1973. 123 refs.*

Occupational and public health effects of generating electricity from coal, uranium, and oil are compared, with particular attention given to accident and chronic-disease rates for fuel extraction and airborne emissions from power and reprocessing plants. Uranium offers less of a health hazard as a fuel than coal. Oil offers lower risks than coal in both the extraction phase and the generation phase. The comparison between low-sulfur oil and uranium is less clear-cut. (Author abstract modified)

53995 **APTIC NO. 77717**

Lenghel, I., M. Deleanu, N. Radulescu, and N. Moldovan

MORBIDITY DATA ON URBAN POPULATION IN TOWN WITH HIGH AIR POLLUTION LEVEL DUE TO CHEMICAL INDUSTRY AND BUILDING MATERIALS. *(Dannye o zabolevaemosti naseleniya v gorode s atmosfernym vozdukhom, sil no zagryaznennym predpriyatiyami khimicheskoy promyshlennosti i stroitel nykh materialov). Text in Russian. Zdrav-okhr. (Bucarest), no. 3:301-310, 1973. 6 refs.*

Air pollution and morbidity were studied in Turda, Rumania, in a town with chemical and building materials industry. The concentration of condensation nuclei increased with increasing air pollution level, and it was possible to characterize air pollution by this unspecific parameter. The small ion concentration, usually decreasing with increasing air pollution, was less suitable for air pollution characterization. Significant differences were established in the incidence of respiratory, otorhinolaryngological and allergic diseases as well as of rachitis in children living in areas with different pollution levels in Turda. The incidences of anemia, influenza, otitis media, mastoiditis, and certain diseases of the gastrointestinal tract showed no significant differences as a function of pollution level. Comparison with a town with low pollution levels revealed a significantly increased incidence of chronic bronchitis, penumonia, hypertension, atherosclerosis, gastric and duodenal ulcer in the adult population, and of chronic and acute bronchitis, tonsilitis, pneumonia, cardiovascular diseases, and gastric and duodenal ulcers in the children living in Turda.

53996 **APTIC NO. 78027**

Maruya, H.

AIR POLLUTION AND HUMAN HEALTH IN MIZUSHIMA DISTRICT, OKAYAMA PREFECTURE. *(Okayama-ken Mizushima chiku no taiki osen to kenko). Text in Japanese. Kenko Kaigi (Health Assem.), 25(7):24-30, July 1973. 7 refs.*

The rapid increase of patients, especially babies and infants, due to rapid industrialization in the Mizushima district, Okayama Prefecture, is described. Severe air pollution due to exhausts from smelting furnaces, as well as petroleum combination, is the direct cause of chronic bronchitis, asthmatic bronchitis, bronchial asthma, and emphysema, as well as refractory palingenesis of inflammation of the upper respiratory tract. The percentage of these patients of all hospitalized patients was 3-4 times greater in 1973 than in 1960. This corresponds to the 3-4 fold increase of sulfur dioxide in the district. The morbidity of such diseases in babies and infants is especially high (as compared to that of Kurashiki City). The number of patients who visited Mizushima Kyodo Hospital in May 1969, 1970, 1971, and 1972 were 12, 11, 13, and 17% with pulmonary emphysema, 50, 35, 45 and 53% with bronchial asthma, 67, 84, 82, and 78% with chronic bronchitis, and 33, 29, 65, and 73% with asthmatic bronchitis. Of 90 asthmatic patients who visited the hospital from January to June 1972, only 20% had already been suffering from asthma before the operation of the combination, suggesting that air pollution from industrialization is the major cause of asthma.

53997 **APTIC NO. 78366**

Nobutomo, Koichi and Shin Ishinishi

INVESTIGATION OF CHRONIC RESPIRATORY DISEASES MORBIDITY IN KITAKYUSHU CITY. *(Kitakyushu-shi ni okeru mansei kokyuki shojo yushoritsu no chosa). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):144, April 1973.*

The morbidity of chronic respiratory symptoms was investigated in Kitakyushu city. Subjects were selected at random (1/50) among the residents 40 years of age and older in school districts with a more than 1.5 mg/100 sq cm/day sulfur dioxide concentration for at least three years. Among the subjects, 96.8% (or 658 people) received health examinations and answered the questionnaire based on the BMRC method. The morbidity of chronic bronchitis was 7% among men and 6% among women. Continuous coughs and sputum was 10.1% among men and 6.6% among women. Worsening of these symptoms was 5.2% among men and 6.6% among women. Chronic bronchitis morbidity was 15% among smokers of 20 or more cigarettes a day in the age range of 40-50. The morbidity was 5% among those smoking 10-19 cigarettes a day in the same age range. The rate increased drastically, up to well over 10%, for those in their sixties. The X-ray findings showed suspicious shadows for 11.2% among people in their forties, 13.5% among people in their fifties and 21.3% among people in their sixties.

53998 **APTIC NO. 78306**

Schlipkoeter, H. W.

INFLUENCE OF CARCINOGENIC COMPOUNDS IN THE ATMOSPHERE ON THE POPULATION OF METROPOLITAN AREAS. *(Ovlivneni obyvatel velkomesta kancerogennimi latkami z ovzdusi). Text in Czech. Cesk. Hyg. (Prague), 18(10):447-452, 1973. 23 refs.*

The mortality rate for malignant tumors of respiratory passages and lungs has increased almost twofold in the last 10 yr. The involvement of air pollution in this increase in analyzed. The polycyclic aromatic hydrocarbons are considered to be the most important carcinogenic air pollutants. Inductive epidemiological examination and experimental results indicate that carcinogenic compounds in the metropolitan atmosphere must not be evaluated separately, since the accompanying air pollutants influence their entry into the organism and their biotransformation in metabolic processes as well as carcinogenic irritation. (Author abstract modified)

53999 **APTIC NO. 78233**

Schmidt, P., J. Richter, and I. Pfeifer

A CONTRIBUTION TO THE METHOD OF EXAMINATION OF CHILDREN DURING STUDY OF THE EFFECT OF ATMOSPHERIC CONTAMINATION. *(Prispevek k metodice vysetrovani deti pri studiu vlivu znecisteni ovzdusi). Text in Czech. Cesk. Hyg. (Prague), 18(6 and 7):299-303, 1973. 9 refs.*

Medical examinations which included determinations of muramidase activity in saliva were conducted on 52 boys and 46 girls from an air-polluted urban area and 48 boys and 51 girls from a relatively unpolluted control area. The enzyme activity was determined at the beginning and end of each examination. Children living in the polluted area generally showed lower levels of muramidase than those exhibited by the control group. Both sexes showed similar reactions during the examinations. Children from the polluted area showed higher enzyme levels at the end of the examination than they did at the beginning of the examination, indicating that the examination procedure itself influenced the results. Children from the unpolluted area, however, did not exhibit differences in muramidase activity over the examination period.

1972

54000 **APTIC NO. 77635**

Aretinskiy, B. V., V. A. Syrnev, and A. P. Yastrebov

DISTURBANCE OF THE OXIDATIVE PROCESSES IN THE MITOCHONDRIA OF THE LUNGS AND LIVER OF RATS UNDER THE CONDITIONS OF THE CHRONIC EFFECT OF DIESEL EXHAUST GASES. *(K voprosu o narushenii okislitel nykh protsessov v mitokhondriyakh legkikh i pecheni krys v usloviyakh khronicheskogo deystviya dizel nykh vykhlopnykh gazov). Text in Russian. Vop. Reaktiv. Fiziol. Sist. Organizma, Tr. Konf. Ural. Mezhobl. Obshchestv. Patofiziol., 8th, 1972, p 94-96.*

The effect of diesel exhaust gas containing 60 mg carbon monoxide and 0.95-1.4 mg acrolein per cu m on the oxidative processes in the lung and liver mitochondria of albino rats was studied. The animals were exposed to diesel exhaust gases for 6 hr daily over a 1- to 3-mo period. After an initial increase in the rate of oxidative phosphorylation in the lung and liver mitochondria, this parameter showed a significant reduction by 32.8% in the lung mitochondria, and by 39.8% in the liver mitochondria. The reduction was primarily due to the reduction of the rate of respiration of the mitochondria, which indicates a reduction in the activity of the respiratory enzymes in the mitochondria. The reduced rate of 14C-glycerine incorporation in lung proteins is indicative of lung fibrosis. Similar findings were obtained with a combination of diesel exhaust and quartz dust.

54001 **APTIC NO. 77633**

Bernshtein, L. M.

PHAGOCYTOSIS REACTION IN EXPERIMENTAL ANIMALS ON CHRONIC POISONING BY VAPORS OF BENZENE AND ITS METHYL DERIVATIVES. *(Reaktsiya fagotsitoza u eksperimental nykh zhivotnykh pri khronicheskom otravlenii ikh parami benzola i ego metilproizvodnykh). Text in Russian. Vop. Gig. Tr. Profzabol., Mater. Nauch. Konf., Karaganda, USSR, 1972, p. 53-54.*

The effect of benzene, toluene, xylene and mesitylene on phagocytosis was studied. Serum samples taken from rats exposed to the vapors of these substances at a concentration of 1000 mg/cu m for 6 mo, and Staphylococcus were used for the experiments. Benzene and toluene caused phasic inhibition of the phagocytic activity. Benzene depressed phagocytosis from the second week to 1.5 mo, and from 3.5 mo until the end of the experiment. Toluene depressed phagocytosis from the second week until the first month and a half, and from the fourth month until the end of the experiment. The phagocyte count showed no change in rats exposed to xylene and mesitylene, and the reduction in the phagocytic index was not significant statistically.

54002 **APTIC NO. 77634**

Burkhanov, A. I.

TOXICITY OF SELENIUM-ARSENIC CAKE DUST. *(Eksperimental noe issledovanie toksichnosti seleno-myshyakovogo keka). Text in Russian. Vop. Gig. Tr. Profzabol., Mater. Nauch. Konf., Karaganda, USSR, 1972, p. 69-71.*

The effect of selenium-arsenic cake dust on albino rats was studied. The dust contained 15-30% arsenic, 2.9-15.7% selenium, and about 10% lead. The animals were exposed to this dust in the air at a concentration of 80 mg/cu m for 4 hr daily for 12 mo, or to 2 mg/cu m for 4 mo. Statistically significant reduction of the oxygen uptake, and elevation of the stimulation threshold were observed in the animals exposed to the higher dust concentration. These changes were less marked in the group exposed to 2 mg/cu m concentration. Slight reduction in the detoxification capacity of the liver, increase in the relative weight of the lungs with increased collagen fraction, inflammation of the bronchi and interstitial tissue, and moderate diffuse sclerotic pneumoconiosis were found by histological investigation. Significant reduction of the erythrocyte count and hemoglobin level was observed.

1971

54003 **APTIC NO. 77983**

Leong, Basil K. J., Harold N. MacFarland, and William H. Reese, Jr.

INDUCTION OF LUNG ADENOMAS BY CHRONIC INHALATION OF BIS(CHLOROMETHYL)ETHER. *Arch. Environ. Health, vol. 22:663-666, June 1971. 14 refs. (Presented at the Society of Toxicology, Annual Meeting, 7th, Washington, D. C., March 5, 1968.)*

The carcinogenic effects of haloethers in the lungs of strain A mice following repeated vapor inhalation exposure for 6 mo are described. Repeated inhalation of the vapors of bis(chloromethyl) ether and chloromethyl methyl ether at 1 and 2 ppm, respectively, and of the aerosol of urethane at 138 ppm result in an increase in incidence of pulmonary adenomas in the mice. The high toxicity of the two haloethers and the general lack of properties irritating to the upper respiratory tract in all three compounds pose an industrial handling hazard. (Author abstract modified)

1963

54004 **APTIC NO. 77982**

Lester, D., L. A. Greenberg, and W. Robert Adams

EFFECTS OF SINGLE AND REPEATED EXPOSURES OF HUMANS AND RATS TO VINYL CHLORIDE. *Ind. Hyg. J., p. 265-275, May-June 1963. 5 refs. (Presented at the Industrial Hygiene Association, Annual Meeting, 23rd, Washington, D. C., May 1962.)*

The effects of single and repeated exposures of humans and rats to vinyl chloride were investigated. From 5-minute exposures of human subjects to concentrations ranging from 0.0% to 2.0%, it is estimated that a prolonged exposure to a level of more than 0.6% is necessary to produce minimum symptoms of intoxication. Rats exposed 8 hr daily at concentration of 2% for 3 mo and 5% for 19 days exhibit changes in liver and spleen weight and in red and white cell counts. Except in the case of the liver, tissue alterations do not accompany these changes. The alterations in liver morphology are within the normal range and are not pathologic in character. Rate of growth, serum transaminase and hemoglobin are unchanged and the present threshold limit value of 0.05% is adequate. (Author abstract modified)

EFFECTS-PLANTS AND LIVESTOCK

1975

54005 **APTIC NO. 78202**

Akino, K., T. Komeichi, M. Funajima, and T. Ohira

POLLUTION CHAIN OF AIR POLLUTANTS. (I). TRANSFER OF HEAVY METAL COMPOUNDS INTO RICE. *(Taiki osenbushitsu no osen rensa (I). Jukinzoku osen bushitsu no kome e no iko). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:63-71, 1975. 10 refs.*

Air pollution by heavy metals and its relationship with the emission level and the concentration in rice were investigated from 1969 to 1972. The highest lead, iron, manganese, copper, cadmium, nickel, vanadium, and chromium concentrations in the atmosphere at 13 locations in Tokyo in 1972 were 1.327, 5.479, 0.410, 0.366, 0.063, 0.128, 0.041 and 0.107 micro g/cu m, respectively. The concentrations were generally 10-70-fold those at the control area (Ogasawara). Metals emitted from combustion (Pb, Mn) showed smaller particle size, approximately 60% of them below 1.6 micron. The concentrations corresponded well to the total annual emissions. The Pb, Mn, Cd, and Fe concentrations in soil resulting from air pollution were found to be 0.55, 0.49, 0.05 and 16.8 ppm, respectively, approximately 1/10 - 1/1000 of the total concentrations in soil. About 0.0011 ppm Cd, 0.0016 ppm Pb and 0.053 ppm Mn in rice in the area were from air pollution.

54006 **APTIC NO. 78391**

Bell, J. N. B. and R. A. Cox

ATMOSPHERIC OZONE AND PLANT DAMAGE IN THE UNITED KINGDOM. *Environ. Pollut., 8(3):163-170, April 1975. 17 refs.*

Three tobacco varieties, differentially susceptible to ozone, were exposed outdoors 32 km west of central London, during the summer of 1972. At the same time the atmosphere was continuously monitored for O3. Extensive damage appears on the leaves of the sensitive variety (Bel-W3), but little or no damage is observed on the two more resistant varieties (Bel-B and Bel-C). The injury resembles that reported elsewhere for O3 on tobacco, and the amount of damage appearing in a given period is significantly positively correlated with the number of hours during the time that the O3 concentrations exceeds the maximum natural level. The Bel-W3 tobacco variety is suitable for use as an indicator of low levels of atmospheric O3 under British conditions. The possibility of O3 damage occurring on crops in Britain is discussed. (Author abstract modified)

54007 **APTIC NO. 77911**

Case, James W.

EPIPHYTIC LICHENS AS BIOLOGICAL INDICATORS OF AIR POLLUTION IN WESTCENTRAL ALBERTA: A PROGRESS REPORT. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 143-152. 2 refs. (Jan. 16-17.)*

The frequency of occurrence of five species of epiphytic lichens on lodgepole pines was studied around two natural gas processing plants. The frequency of the lichens drops as the natural gas processing plants, which emit sulfur dioxide, are approached. Epiphytic lichens of lodgepole pine show different levels of sensitivity to SO2 pollution. Both the length of time a natural gas processing plant has been in operation and the topography may be involved in the amount of damage done to the environment in their vicinity.

54008 **APTIC NO. 77920**

Dick, A. C. and D. R. Walker

ADSORPTION OF ATMOSPHERIC SULFUR GASES BY BARE SOILS. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Envoronmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 77-83. 2 refs. (Jan. 16-17.)*

The contribution of atmospheric sulfur gases to plant and soil systems in central Alberta was studied. Test sites were set up in an area having numerous sulfur extraction and sour gas plants, and control sites were established outside the high sulfur emission area. Three 1-quart plastic canisters of four different soils were set on a protected shelf at each site. The soils used were clay loam, silty clay loam, and two types of sandy loam. One canister of each soil was maintained air dry and the other two canisters of each soil were watered to field capacity weekly with distilled water. Soils were analyzed after remaining at the sites from June 1973 to September 1973. Rainfall was also collected. Fine textured soils adsorbed considerably more sulfur from the atmosphere than did coarse textured soils. Wetted soils, regardless of texture, accumulated more sulfur than the same soils kept dry. Maximum adsorption measured was 3.1 kg sulfur per ha for the 3 mo the soils were exposed. No significant changes in soil pH were found. Total sulfur brought down in rainfall for the three month perod was significantly correlated with the amount of sulfur adsorbed from the atmosphere by soils.

54009 **APTIC NO. 78065**

Gill, R., M. H. Martin, G. Nickless, and T. L. Shaw

REGIONAL MONITORING OF HEAVY METAL POLLUTION. *Chemosphere, 4(2):113-118, April 1975. 4 refs.*

The use of mosses to regional survey the pollution levels of airborne heavy metals over an area of 4500 sq km in the southwest of England is described. A total of 330 sites were selected and distributed so as to give adequate detail for interpolation procedures during mapping. At each site a standard moss bag (600 mg of dry Sphagnum moss) was suspended at a height of 2 m. Additional bags for mercury and arsenic analysis were suspended at every eighth site. Following a 6-week exposure period, the moss bags were collected, dried, wet-ashed with nitric acid, and analyzed by atomic absorption spectrometry for lead, zinc, copper, nickel, cadmium, iron, and manganese content. The influence of a large primary zinc and lead smelting works was evidenced by computerized interpolations of isolines for the airborne deposition of cadmium and lead over the 6-week period.

54010 **APTIC NO. 78067**

Hall, Charles A. S., Carl A. Ekdahl, and Daniel E. Wartenberg

A FIFTEEN-YEAR RECORD OF BIOTIC METABOLISM IN THE NORTHERN HEMISPHERE. *Nature (London), 255(5504):136-138, May 8, 1975. 27 refs.*

A model of the biotic metabolism (photosynthes/respiration) in the Northern Hemisphere is developed based on a nearly continuous record of the atmospheric concentration of carbon dioxide over a 15-year period (1958-1972) at Mauna Loa, Hawaii. The analysis of net hemisphere metabolism is performed by normalizing month- by-month CO2 data wherein industrially derived CO2 is subtracted from the total. Month-by-month global industrial fuel combustion data for CO2 generation is estimated by multiplying the global annual rates of anthropogenic CO2 production by monthly proportions determined from patterns in the United States. These numbers are then corrected for the estimated rate of oceanic CO2 uptake. There is no evidence for changes in the basic pattern of Northern Hemisphere biotic metabolism over the 15-year period within the limits of the method s resolution, despite the adverse effects of industrial processes on many individual aspects of the biosphere.

54011 **APTIC NO. 78164**

Harward, Max and Michael Treshow

IMPACT OF OZONE ON THE GROWTH AND REPRODUCTION OF UNDERSTOREY PLANTS IN THE ASPEN ZONE OF WESTERN U.S.A. *Environ. Conserv., 2(1):17-23, Spring 1975. 7 refs.*

The effect of ozone on the growth and reproduction of understorey species of the aspen community was investigated. Plants of 14 species were exposed to 30 pphm O3, 15 pphm O3, ambient air reaching 5-7 pphm during about 2 hr each day, and filtered air. At 15 pphm, growth of Isatis tinctoria, Madia glomerata, and Viola italica was significantly reduced but growth of Ligusticum porteri and Polygonum aviculare was increased. At 30 pphm, growth was substantially suppressed in all plants except Chenopodeium album and Phacelia heterophylla. At 15 pphm, seed production by Madia glomerata and Polygonum douglasii was significantly reduced. At 30 pphm, seed production was also reduced in Polygonum aviculare and Lepidium virginicum. (Author summary modified)

54012 **APTIC NO. 77913**

Hocking, Drake

INTERIM REPORT ON LONG-TERM IMPACT ON THE FOREST OF EMISSIONS FROM A SULPHUR EXTRACTION PLANT. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 132-138. 5 refs. (Jan. 16-17.)*

A survey of the forest around a gas plant was undertaken to detect possible long term or cumulative impact on the bioproductivity of the area. Sites were chosen 3, 6, 12, 25, 50, and 75 km from the plant, along each of the eight cardinal compass directions. Three lodgepole pine trees were felled at each site; three or more branches were sampled from the mid-crown of each tree; complete discs were cut from the base, 1.3 m, and 3.0 m heights, and the soil was sampled. The soil analyses yielded no clear indications of trends or gradients with distances from the gas plant in pH, conductivity, or sulfur content. The pH of the surface litter layer was consistently about one pH lower than in comparable soils elsewhere. There is little evidence of increased acidity in the mineral soil. Analyses of sulfur content of pine needles and twigs show no clear evidence of trends or gradients. No differences among internode lengths were relatable to distance from gas plants. The absence of prominent trends or gradients in the observed levels of sulfur may be due to the influence of 10 other gas plants within about a 150 km diameter.

54013 **APTIC NO. 78059**

Horsman, D. C. and A. R. Wellburn

SYNERGISTIC EFFECT OF SO2 AND NO2 POLLUTED AIR UPON ENZYME ACTIVITY IN PEA SEEDLINGS. *Environ. Pollut., 8(2):123-133, Feb. 1975. 31 refs.*

Fumigations with sulfur dioxide, nitrogen dioxide, or a combination of both were carried out on 9-day-old pea seedlings (Pisum sativum) for a period of 6 days. A comparison of the activities of ribulose diphosphate carboxylase, glutamate-pyruvate transaminase, glutamate-oxaloacetate transaminase, and peroxidase enzymes in extracts from fumigated seedlings showed various differences with respect to those of control seedlings. In some cases the threshold concentration of a pollutant required to produce a change in enzyme activity was lowered when combinations of pollutants were used. A synergistic effect between the pollutants was clearly reflected in enzyme activity changes for ribulose diphosphate carboxylase and peroxidase at concentrations within the ranges of 0-2 ppm SO2 and 0-0.1 ppm NO2 and also for peroxidase at concentrations within the ranges of 0-0.2 ppm SO2 and 0-1 ppm NO2. (Author abstract modified)

54014 **APTIC NO. 77743**

Klingaman, Gerald L. and Conrad B. Link

REDUCTION AIR POLLUTION INJURY TO FOLIAGE OF CHRYSANTHEMUM MORIFOLIUM RAMAT. USING TOLERANT CULTIVARS AND CHEMICAL PROTECTANTS. *J. Am. Soc. Hort. Sci., 100(2):173-175, March 1975. 13 refs.*

The range of chrysanthemum sensitivity to ozone pollution was investigated by exposing 45 cultivars to ambient ozone levels in a controlled environment chamber. A wide range of sensitivity was observed, with some cultivars exhibiting sufficient sensitivity to be damaged by ambient oxidant concentrations. The effect of chemical protectants on ozone-induced injury to foliage of the pollution sensitive King s Ransom and the pollution tolerant Yellow Jess Williams was also investigated. No visible injury occurred on unprotected Yellow Jess Williams, but extensive injury occurred on older foliage of King s Ransom. Full season protection was observed on King s Ransom receiving treatments of benomyl, thiophanate ethyl, or ancymidol. Ancymidol delayed anthesis and reduced flower count, however. Pollution damage to most greenhouse, field, or garden grown chrysanthemums does not appear to be sufficiently serious at present to warrant direct chemical control.

54015 **APTIC NO. 78171**

Markowski, A., S. Grzesiak, and M. Schramel

SUSCEPTIBILITY OF SIX SPECIES OF CULTIVATED PLANTS TO SULPHUR DIOXIDE UNDER OPTIMUM SOIL MOISTURE AND DROUGHT CONDITIONS. *Bull. Acad. Polon. Sci. Ser. Sci. Biol., 22(12):889-898, March 1975. 5 refs.*

The susceptibility of six species of cultivated plants to exposure to sulfur dioxide at concentrations of 0.3 and 0.5 ppm was investigated under optimum soil moisture and drought conditions. Under optimum soil moisture conditions, SO2 produces a significant drop in dry weight yields of stems, shoots, and leaves, and reduces the height of plants. Under drought conditions, drop of dry weight yields and reduced height are much smaller. Gassing under optimum soil moisture conditions gives a much higher increase of sulfate sulfur content in tissues than gassing under drought conditions. Chlorophyll content in plants after gassing is either lower (sunflower, barley, maize) or higher (tobacco, broad bean, bean) than in control plants. Under drought conditions these changes follow a more favorable trend. When SO2 concentration is 0.5 ppm, the drop of chlorophyll content under optimum soil moisture conditions is greater than under drought conditions in all six experimental species. (Author abstract modified)

54016 **APTIC NO. 78058**

McLaughlin, Samuel B., Jr. and Robert L. Barnes

EFFECTS OF FLUORIDE ON PHOTOSYNTHESIS AND RESPIRATION OF SOME SOUTH-EAST AMERICAN FOREST TREES. *Environ. Pollut., 8(2):91-96, Feb. 1975. 14 refs.*

The effects of fluoride on the photosynthesis and respiraation of detached pine needles and hardwood leaves were investigated. Apparent photosynthesis was commonly depressed when foliage was allowed to take up sodium fluoride solutions ranging from 0.0001 to 0.01 molar concentration. Dark respiration was commonly stimulated at low levels of NaF (0.001-0.0001 M). Higher concentrations of NaF (0.01 M) either stimulated dark respiration (in most hardwoods) or inhibited it (in pines and some hardwoods). Pines were generally more sensitive than hardwoods, and current-year needles were more sensitive than 1-year-old needles. The concurrent stimulation of dark respiration and the inhibition of apparent photosynthesis suggested that growth reduction can occur in trees accumulating low levels of foliar fluoride. (Author abstract modified)

54017 **APTIC NO. 77785**

Muggleton, John, David Lonsdale, and Brian R. Benham

MELANISM IN ADALIA BIPUNCTATA L (COL., COCCINELLIDAE) AND ITS RELATIONSHIP TO ATMOSPHERIC POLLUTION. *J. Appl. Ecology, 12(2):451-464, Aug. 1975. 35 refs.*

The relationship of melanism in Adalia bipunctata L. to atmospheric pollution is discussed. The effects of thermal melanism is related directly to the biology of A. bipunctata. There is no evidence of a similar biological effect caused by any of the components of air pollution. Without doubt smoke pollution does influence melanic frequency in A. bipunctata, as it is one of the factors responsible for reducing sunshine levels, especially in misty autumn weather. Smoke is not the major factor in determining sunshine levels. The reduction of sunshine hours by climatic factors excluded the use of A. bipunctata as a biological indicator of smoke pollution.

54018 **APTIC NO. 77925**

Nyborg, M., A. C. Dick, J. M. Crepin, R. F. Klemm, J. Baker, and D. Hocking

CURRENT RESULTS ON FATE OF ATMOSPHERIC SO2 AND ITS EFFECT ON SOIL, WATER AND VEGETATION. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 66-76. 5 refs. (Jan. 16-17.)*

Ninety-two sites were used to determine sulfur deposition in different forms and its effect on soil acidification. Rainfall was collected weekly at each site for determination of pH and sulfate content. Some snow samples were also collected. A soil exposure experiment was conducted consisting of three agricultural soils placed in open containers under a canopy which protected them from rain but exposed them to the atmosphere. They were watered to field capacity weekly. They were exposed for about three months and then analyzed for pH and sulfuric acid. Barley was grown at some sites and later analyzed. Dust was collected at a few stations. High volume air samplers collected particulates on a glass fiber filter for a week at different locations. The filters were analyzed for elemental sulfur, sulfate, total sulfur, and some cations. Sulfur gas emissions may affect large areas downwind from the source. The amount of S deposited by rainfall may not be as important as direct adsorption and subsequent absorption by soil and vegetation in areas close to the emission source. Such depositions cause acidification of the exposed soils under canopies. A considerable proportion of the total sulfur deposited in areas distant but downwind from the sulfur dioxide emission sources may come down with particulates which travel long distances.

54019 **APTIC NO. 78213**

Ricks, G. R. and R. J. H. Williams

EFFECTS OF ATMOSPHERIC POLLUTION ON DECIDUOUS WOODLAND. PART 3: EFFECTS ON PHOTOSYNTHETIC PIGMENTS OF LEAVES OF QUARCUS PETRAEA (MATTUSCHKA) LEIBL. *Environ. Pollut., 8(2):97-106, Feb. 1975. 25 refs.*

Seasonal vibration in the chloroplastidic pigments of leaves from Quercus petraea grown in an unpolluted area and in a deciduous woodland exposed to high levels of particulate pollution was investigated. High particulate levels are known to enhance the rate of sulfur dioxide uptake in leaves. Chlorophyll a degradation was high in comparison to chlorophyll b degradation at the most polluted area, presumably due to increased acidic conditions within the leaf. Enhanced levels of leaf sulfur appear to lead to the preferential degradation of chlorophyll a over chlorophyll b. The relative carotenoid levels of leaves from the polluted site were the reverse of those in leaves undergoing normal senescence at the control site, and senescence was earlier for leaves at the polluted site.

54020 **APTIC NO. 77923**

Shipley, Brent L.

SHORT AND LONG TERM EFFECTS OF SULFUR GAS EMISSIONS ON GRAY WOODED AND DARK GRAY WOODED SOILS AND EVIDENCED BY STUDIES IN THE WHITECOURT AND EDSON FOREST REGIONS OF ALBERTA. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 84-93. 2 refs. (Jan. 16-17.)*

Soil surveys were carried out in a 12,000 square mile study area, where 11 sour gas processing plants emit a total of 750 long tons of sulfur per day. Two sites were selected in control areas away from the influence of the gas plants. Distilled water was exposed to the atmosphere to obtain data on the absorption of sulfur compounds by the water surface. Rainfall samples were collected. Soil was placed in a plastic waste basket with holes in the bottom covered by filter paper to allow a clear leachate to drain into a second waste basket in which the first was placed. Imported soil with the surface exposed, imported soil with the surface covered by moss, and native soil cores were used. Samples were also collected from otherwise undisturbed native soils. The waterdish experiments showed a pronounced difference in sulfur accumulation between the control and exposed sites. Potted soils showed a definite increase in sulfur accumulation at exposed sites over the control sites. The average sulfur absorption by the moss covered soils was 0.41 times as much as for the bare surface treatment. Sulfur removed from the soil in the leachate exceeded that which was deposited on the soil by precipitation. These results show that leaching is an important mechanism in protecting the soil from accumulating excessive amounts of sulfur in areas where sulfur deposition occurs. No evidence was found to indicate that soil properties had changed due to emissions of sulfur compounds from the gas plants.

54021 **APTIC NO. 77750**

Srivastava, H. S., P. A. Jolliffe, and V. C. Ruenckles

THE INFLUENCE OF NITROGEN SUPPLY DURING GROWTH ON THE INHIBITION OF GAS EXCHANGE AND VISIBLE DAMAGE TO LEAVES BY NO2. *Environ. Pollut., 9(1):35-47, July 1975. 19 refs.*

The effects of nitrogen dioxide on the appearance and gas exchange of leaves of bush bean grown with different concentrations and sources of nitrogen were examined. Nitrogen nutrition influences visible damage to leaves and the inhibition of photosynthesis and respiration by 3.0 ppm NO2. The rate and time course of NO2 uptake are affected by N2 supply during plant growth. The characteristics of NO2 uptake are consistent with the operation of a pathway of NO2 assimilation via nitrate and nitrite reduction. The degree of inhibition caused by NO2 is not always correlated with the rate of NO2 uptake. The inhibitory effects of NO2 on photosynthesis and respiration are correlated with the activities of photosynthesis and respiration per unit leaf protein. The effects of NO2 on leaves depends on changes in leaf proteins. (Author abstract modified)

54022 **APTIC NO. 77922**

Thompson, M. D.

PRELIMINARY INVESTIGATIONS ON THE USE OF THERMAL IMAGERY FOR DETECTION OF SULPHUR DIOXIDE STRESSED VEGETATION. *Al-*

berta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre. Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 122-131. 11 refs. (Jan. 16-17.)

To evaluate the usefulness of thermal imagery for detection of sulfur dioxide stressed vegetation, infrared temperature measurements of stressed vegetation were made on the ground and from a helicopter, in conjunction with thermal linescan surveys. The ground and helicopter measurements indicated that a relative temperature difference does exist between stressed and healthy vegetation, both coniferous and deciduous, which is within the thermal resolution limits of the linescanner. The difference is maximized between noon and 5:00 pm in the summer months. Due to problems of scale, results from imagery analysis were less conclusive since barely more than 50% of the stressed vegetation could be identified on the imagery. The temperature difference between stressed and healthy vegetation is reduced as temperatures were integrated over a wider area. (Author abstract modified)

54023 **APTIC NO. 77910**

Wride, M. C.

THE EFFECT OF SULPHUR-DIOXIDE EMISSIONS ON MOOSE (ALCES ALCES) IN THE WHITECOURT FOREST. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 153-160. 7 refs. (Jan. 16-17.)*

A two year study of moose density, productivity, and habitat utilization was conducted on study areas downwind of sulfur dioxide producing gas plants in the Whitecourt Forest area. Density and productivity were estimated using aerial survey, pellet group counts, and a questionnaire. Utilization studies measured utilization and condition and included browse species density and composition. The results showed no correlation of moose density, productivity or utilization with either gas plant size in terms of sulfur dioxide effluents or proximity to gas plants. No evidence suggested that sulfur dioxide was detrimental to moose. However, the theoretical implications of long term sulfur deposition were not eliminated. (Author abstract)

1974

54024 **APTIC NO. 78167**

Markowski, A. and S. Grzesiak

INFLUENCE OF SULPHUR DIOXIDE AND OZONE ON VEGETATION OF BEAN AND BARLEY PLANTS UNDER DIFFERENT SOIL MOISTURE CONDITIONS. *Bull. Acad. Polon. Sci. Ser. Sci. Biol., 22(12):875-888, 1974. 14 refs.*

The effects of toxic gases on extent of injuries to assimilating surface, dry weight yields, and generative development in bean and barley were studied in three successive phases of vegetation under conditions of optimum soil moisture and of drought just above the wilting point. Experiments with ozone and sulfur dioxide on bean and SO2 on barley demonstrate that the susceptibility of plants to toxic gases decrease under drought conditions that cause a temporary dehydration of tissues. Determinations of sulfate sulfur contents in different plant organs show that a lower hydration of tissues is accompanied by lower adsorption of sulfur dioxide. (Author abstract modified)

54025 **APTIC NO. 77792**

Oe, Masahara and Kaneo Mega

STUDIES ON THE EFFECTS OF AIR POLLUTION ON CROPS. PART I. EFFECTS OF GASEOUS SULFUR DIOXIDE AND OZONE ON THE OCCURRENCE OF SYMPTOMS OF INJURIES ON VEGETABLES. *(Nosakumotsu no taiki-osen ni kansuru kenkyu. (I) Aryusan gasu oyobi ozon gas yasai-rui no gaicho hatsugen ni oyobosu eikyo). Text in Japanese. Osaka-fu Noringijutsu Center Kenkyu Hokoku (Bull. Osaka Prefect. Agric. Res. Cent.), no. 11:151-157, June 1974. 8 refs.*

In order to obtain information on plant injuries due to air pollution and to utilize susceptible plants as biological indicators of air pollution, potted plants such as chard, spinach, Chinese cabbage, and Japanese radish or cut plants such as Welsh onion were exposed in a glass house to sulfur dioxide at 0.4 ppm continuously for a week or to ozone for 6 hr at 0.13, 0.2, 0.4 and 0.6 ppm. The symptoms due to sulfur dioxide appeared first as perhipheral and interveinal necrosis, followed by dehydration. The period of exposure required for the appearance of inuries depended mainly on the vegetable species and ranged from 1 day for potted herb mustard to more than a week for maize. A variety of cabbage did not show any injury after 1 week of continuous exposure to sulfur dioxide. The symptoms due to ozone appeared on the veinal or interveinal parts of leaves and were white to light brown in color on cruciferous vegetables and onions. Brown spots appeared on cucumber, and brown, reddish- purple, or dark purple lesions appeared on burdock, rice, and kidney bean. Damage was most severe on cucumbers occurring even at 0.13 ppm. The environmental conditions before and after the exposure to these gases affected the appearance of the symptoms.

54026 **APTIC NO. 78361**

Tachiya, T., H. Tatekawa, T. Kanno, and S. Saito

STUDIES ON THE HEAVY METAL POLLUTION OF CROPS AND SOIL IN FUKUSHIMA PREFECTURE, PART IV: INFLUENCE OF CADMIUM POLLUTION ON RICE IN THE EAST PART OF BANDAI TOWN IN 1972. *(Fukushima-ken ni okeru nosakumotsu oyobi dojo no kukinzoku osen no jittai -dai 4ho- 1972 nen ni okeru Bandai-cho tobu no hoi, kyori-betsu no koka Cd to osen to no kankei). Text in Japanese. Fukushima-ken Nogyo Shikenjo Kenkyu Hokoku (Annu. Rep. Stud. Fukushima Prefect. Agr. Exp. Sta.), no. 13:9-13, March 1974. 3 refs.*

Due to the improvement of facilities in the refinery in Bandai Town, the amount of cadmium emission in May 1972 was only 22% of that in August 1970. The relationship between cadmium emissions and pollution of brown rice was studied again in 1972. The total cadmium emission in 1972 was about 70 g/day, and the cadmium emission in a rice growing season was 1.8-5.7 mg/sq m. The cadmium content of brown rice harvested from an unpolluted field on 0.1-0.8 ppm. The cadmium emission was large in the E-ES in June, in NW in July, and in the E in August. The monthly cadmium emission was decreased in the order of June, August and July. The pollution of rice was affected by cadmium emission 20% in the early growing state, 8% in the middle growing stage and 72% in late growing stage. With a cadmium emission of 1 mg/sq m, the cadmium content of brown rice became 0.021 and 0.795 ppm, respectively, when the emission occurred before earing and after earing.

54027 **APTIC NO. 78284**

Tanibuchi, M.

PLANT DAMAGE DUE TO SULFUR DIOXIDE AT A LOW CONCENTRATION. *(Tei nodo no aryusan gasu ni yoru jumoku no higai). Text in Japanese. Rep. of Stud. of Tokushima Prefect. For. Exp. Stn., no. 12:73-76, March 1974. 3 refs.*

Young potted trees (2-3 years) of species Quercus phillyraeoides, Liquidambar formosana, Metasequoia glyptostroboides, Zelkova seratta, Roninia pseudo-acacia and Pterocarya sp. were exposed to 0.5 ppm of sulfur dioxide for 40 hr (8 hr/day, five days) in a room at 23 C, and a relative humidity of 60%. Other potted trees of species L. f. and Q. p. were exposed to 10 ppm of SO2 for 3 hr. The damage to the trees was surveyed 3-5 days after exposure. Of the group exposed to 0.5 ppm of SO2, two thirds of the leaves of Pterocarya and R.p- a. discolored to dark-brown and greyish green respectively. One third of the leaves of M. g. discolored to yellowish-brown, a quarter of the leaves of Z. s. discolored to greyish-green and greyish-brown. No discoloration was observed in L. f. and Q. p., as compared to the trees of the same species not exposed to SO2. Of the group exposed for a shorter time to 10 ppm of SO2, two thirds of the leaves of L. f. turned reddish-brown and half of the leaves of Q. p. turned yellowish- or reddish-brown. No direct relationship was found between the sulfur content of the leaves and leaf-damage, the sulfur content of damaged leaves being 0.19-0.39%, and that of non-damaged leaves being 0.16-0.29%. However, the sulfur content of exposed leaves was higher than that of non-exposed leaves, and the damage appeared when the sulfur content reached a certain level. In the leaves exposed to 10 ppm of SO2 the sulfur content was the same as in non-exposed leaves, suggesting the destruction of leaf tissues before the accumulation of sulfur.

1973

54028 **APTIC NO. 78020**

Takeshino, K., H. Noguchi, and K. Niihara

A STUDY OF THE ABSORPTION OF HEAVY METALS FROM LEAF-SURFACES OF RICE PLANTS. *(Suito no jukinzoku yomen kyushu ni kansuru kenkyu). Text in Japanese. Preprint, Society of Science of Soil and Manure, Japan, no. 19:149, Sept. 1973. (Presented at the Sendai Meeting of the Society of Science of Soil and Manure, Japan, 1973.)*

A study was done to determine whether heavy metals, especially cadmium, are absorbed by rice plants, and if so, when the maximum content of cadmium in unpolished rice grains occurs. Further, the purpose was to discover how cadmium is distributed in the mature plants in cases of absorption via leaves and via roots. Seedlings were grown in unpolluted soil and exposed during the ear-premordia, mitotic, complete heading, and milky stages to cadmium chloride fumes for 1 hr. The amounts of CdCl2 evaporated were 383 and 38.3 mg in the exposure rooms. Four additional plots were treated with 38.3 mg, one being given the former two exposures, the other being given the latter two exposures, and another given four exposures in series at two levels. No effect on dry, mature plant weight was observed. An accumulation of CdCl2 was observed in all unpolished rice grains. The residul content of cadmium in the grains of plants given four exposures of 383 mg was 3.45 ppm. The content of cadmium given a single exposure was highest in plants treated at the heading stage, followed by those treated at the milky stage. In the ripening stage, the Cd content was highest in the leaves, especially the lower leaves, followed by the leaf-sheath and the stalks. In the plants treated prior to ear-issuing, the content was higher in the lower leaves. In those treated after ear-issuing the content was higher in the upper leaves, and also in the hulls. When Cd was absorbed via the roots, the Cd content was high in stalks with 40% accumulation. In aerial absorption, the Cd accumulation in the stalks was less than 10%.

1962

54029 **APTIC NO. 77637**

Svoboda, Jaroslav

POISONING OF BEES BY INDUSTRIAL ARSENIC EMISSIONS. *(Prumyslove otravy vcel arzenem). Text in Czech. Cesk. Akad. Zemedelskych Ved. Sbornik, no. 8:1499-1505, 1962. 5 refs.*

Massive poisoning of bees by industrial arsenic emissions in Czechoslovakia are reviewed. Arsenic emissions from an ore processing plant in Tesin were responsible for massive bee deaths after World War I. Massive death of bees was observed in 1938 in the Krompach region around a copper ore smelting plant which emitted arsenic. Other accidents were reported in 1954 and 1957 in areas around industrial plants and power plants using arsenopyrite-containing low-grade coal or lignite. Arsenic was emitted bound in fly-ash in the form of arsenic trioxide or, in the case of coals containing alkaline chlorides, in the form of arsenic trichloride. The arsenic contamination extended to areas within a radius of 3-7 km. Settled fly-ash contained 0.0004-0.75% arsenic, which was soluble in a citrate-hydrochloric acid solution of pH 3.9, which corresponds to the gastric acid of bees. The arsenic uptake by the bees from pollen was calculated to amount to 1 microgram daily, against a toxic dose of 0.37 microgram. The toxic effect of arsenic on bees can be abated by adding colloidal iron hydroxide to the sugar solution which they are fed.

EFFECTS-MATERIALS

1975

54030 **APTIC NO. 77775**

Mohler, J. B.

CORROSION OF COATED METALS. *Metal Finishing, 73(9):48-51, Sept. 1975. 10 refs.*

Factors which influence the corrosion rate on a world wide basis are discussed. Humidity, most moisture, condensation, rain, dust, soot, bases, and temperature promote corrosion. Corrosive areas are prevalent around industry, crowded cities, unusual climates, and unexpected pollutants. Soil, clay, soot, and grease contaminate surfaces, hold particulate matter, absorb moisture, and capture acidic gases. Occasional rains activate a corrosive medium. Outer horizontal surfaces provide a resting place for accumulation of solid contaminants.

54031 **APTIC NO. 78205**

Suzuki, S., K. Matsumoto, and H. Sato

STUDIES ON METAL CORROSION CAUSED BY AIR POLLUTANTS (II). ANALYSIS OF COPPER PLATE SURFACE IN ATMOSPHERES SUCH AS SO2 AND NOX BY AUGER ELECTRONIC SPECTROSCOPY. *(Taiki osenbutsu ni yoru kinzoku fushoku ni kansuru kenkyu (Dai 2 ho): Oje denshi bunko no hi yoru SO2, NOx nadono funikichi ni okeru doban no hyomen no kaiseki). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), no. 2:59-68, 1975. 5 refs.*

A copper plate (1 by 1 by 0.1 cm) was treated with concentrated nitric acid and the surfaces were thoroughly cleaned with distilled water. The plate was placed in a 100 ml tube reactor which was connected to a vacuum line. After drying at 0.005 torr for 0.1-1.0 hr, water was injected through a silicone rubber stopper. The water was evaporated and nitrogen dioxide or sulfur dioxide was introduced with a syringe. After exposure, the pressure was reduced to 0.0000001 torr and the Auger spectrum was recorded. Argon gas was then added to create a pressure of 0.00005 torr and the Auger spectrum was again recorded. Elements including oxygen, sulfur, nitrogen, silver, chlorine, and carbon were detected on the copper surface. Corrosion was detected before argon was introduced. Nitrogen and S disappeared after argon etching occurred.

54032 **APTIC NO. 78281**

Suzuki, Shin, Kazuo Matsumoto, and Harukuni Sato

STUDIES ON METAL CORROSION CAUSED BY AIR POLLUTANTS, PART 1. MEASUREMENT OF CHANGE IN WEIGHT DUE TO CORROSION OF COPPER PLATES IN ATMOSPHERE OF SO2 AND NO2 BY MICROBLAANCE METHOD. *(Taiki osenbutsu ni yoru kinzoku fushoku ni kansuru kenkyu, dai 1-ho, SO2, NO2 nadono fun-iki ni okeru doban no fushoku no mikuro baransu ho ni yoru juryo henka no sokutei). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Res. Rep., Chiba Univ.), no. 2:51, March 1975.*

The corrosion of copper plate by nitrogen dioxide and sulfur dioxide is studied. A copper plated acrylonitrile-butadiene-styrene resin was used as the sample plate which was attached to a microbalance in a cell. The sample plate was sized in 1.5 cm by 1.5 cm and weighed 0.4 g. The cell was first vacuumed to 0.005 torr, to which NO2 and/or SO2 were introduced, and the increase in the sample weight was measured with the exposure time and the concentration of gases. The increase in the plate weight increased with the increased NO2 concentration in the cell, and it was especially rapid when the NO2 concentration was greater than 340 mm Hg. The weight increase observed in the systems with 114, 228, 342, and 452 mm Hg NO2 was nil, 0.005 g, 0.04 g, and 0.14 g respectively after 4 hr of metal exposure in the gas. The corrosion was strengthened by the addition of moisture to the cell. In the system containing 10 mm Hg water, the weight increase after 4 hr exposure was 0.04 g and 0.11 g at the NO2 concentration of 114 and 228 mm Hg respectively. The amount of strengthened corrosion could not be offset by the corrosion caused by water itself, and it was the compounded effect of water and NO2 on the copper corrosion. The corrosion by SO2 was much smaller than that by NO2. The SO2 concentration up to 500 mm Hg did not affect the amount of copper corrosion, and the weight increase was less than 0.005 g. The presence of water in the SO2 system also strengthened the corrosion. The increased weight in the system of 500 mm Hg SO2 and 10 mm Hg H2O was 0.01 g after 4 hr exposure. For the mixed gas exposure of SO2 and NO2, the order of the gas injection into the cell affected the amount of corrosion. Whenever SO2 was first injected, the corrosion was much smaller than that by the injection of NO2 first. The SO2 adsorption on the copper surface prevented corrosion by NO2.

1974

54033 **APTIC NO. 77985**

Gillette, Donald G.

SULFUR DIOXIDE AND MATERIAL DAMAGE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 22p., 1974. 16 refs.*

The change which has occurred with respect to ambient sulfur oxide levels and its impact upon material damage in the United States are evaluated. Air quality data on sulfur dioxide were obtained from 200 or more monitoring sites primarily located in heavily populated or polluted areas. Material threshold damage function data were then compared with SO2 levels, and an estimate of losses, as reflected in increased maintenance and replacement costs, was determined. Estimates of the total stock of various materials in use were derived from census and industry data and allocated geographically according to population. Estimated material damages from SO2 in the atmosphere from 1968 through 1972 and by regions in the United States are presented. From 1968 to 1972, the amount of loss dropped by more than 90% from about $900 million to about $75 million. The estimated percentage of man-made materials exposed to SO2 levvels exceeding the secondary annual average standard (60 micrograms/cu m) and primary annual average standard (80 micrograms/cu m) in the U. S. fell during this period from 20% to less than 5% and from more than 10% to less than 1%, respectively. The greatest decrease occurred in the Northeast, where the damages were originally the greatest. Most of the present loss is attributed to corrosion damage of metallic surfaces that are normally exposed to the ambient environment. (Author abstract modified)

EFFECTS-ECONOMIC

1975

54034 **APTIC NO. 77782**

Kaplan, O. Benjamin, Richard L. Roberts, and Daniel S. Welebir

NEW FRONTIERS: ENVIRONMENTAL HEALTH ECONOMICS. *J. Environ. Health, 37(6):560-562, May-June, 1975. 5 refs.*

Examples of using economic analyses in environmental health are described. A cost benefit analysis critique was developed to evaluate the relative advantages of locating nuclear vs. fossil fuel power plants in the county. The critique shows that valuable information is available from the Environmental Health field. The benefit/cost ratio which was developed for nuclear power does not include the benefits of monetary savings due to cleaner air. This inclusion increases the ratio by about a factor of 10. Environmental Health considerations stopped proposed developments which are too close to freeways: excessive noise levels and excessive lead and other air pollutants made such locations unsuitable for human residence.

54035 **APTIC NO. 77981**

McGlamery, G. G., R. L. Torstrick, W. J. Broadfoot, J. P. Simpson, L. J. Henson, S. V. Tomlinson, and J. F. Young

DETAILED COST ESTIMATES FOR ADVANCED EFFLUENT DESULFURIZATION PROCESSES. *Tennessee Valley Authority, Muscle Shoals, Ala., Environmental Protection Agency EPA IAG-134(D) Part A, Program Element 1AB013, Rept. EPA-600/2-75-006, 418p., Jan. 1975. 62 refs.*

A detailed segmented, highly visible cost comparison of the five leading stack gas desulfurization processes was conducted. Using data available in late 1973, complete economic evaluations were prepared for limestone slurry scrubbing, lime slurry scrubbing, magnesia slurry scrubbing-regeneration to sulfuric acid, sodium solution scrubbing-sulfur dioxide reduction to sulfur, and catalytic oxidation (Cat-Ox). Projections are included for each process design for a base case and sixteen other variations in power unit size, fuel type, sulfur in fuel, unit status (new vs. existing), solids disposal method, and SO2 removal (80% vs. 90%). Capital investment, annual operating costs, and lifetime operating costs were estimated for the base case and each variation. Effects of variations in energy costs, raw material costs, maintenance costs, cost of capital, operating labor cost escalation, and net sales revenue were studied. Investment costs can be altered to reflect any predictable project schedule, escalation rate, or location. Definition of the systems estimated, sources of cost data, and recommended equipment size-cost scale factors are given. The ranges in estimated capital cost of these processes are substantial. (Author abstract)

54036 **APTIC NO. 77822**

Porter, Fred L.

THE INTERACTION OF THE ENERGY CRISIS AND ENVIRONMENTAL PROTECTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-08.1.)*

Interactions of the energy crisis and environmental protection measures are discussed. The fact that approximately one-half of all the energy consumed in the United States is wasted by being rejected into the environment argues against the notion that a conflict exists between environmental protection and energy conservation. A specific example of the compatibility of energy conservation and pollution abatement is the use of flash smelting to control sulfur dioxide emissions from primary copper smelters. The actual energy consumption required to extract and refine a unit of copper, including the energy required to control air pollution, decreases by some 20% when this method is employed in place of electric or reverberatory smelting.

54037 **APTIC NO. 78314**

REPORT: INVESTIGATION CONCERNING ENVIRONMENTAL IMPROVEMENT EXPENDITURES. (1974 SURVEY COMMISSIONED BY ENVIRONMENTAL AGENCY). *(Hokoku: Kankyo kaizen no hiyo ni kansuru chosa. (Showa 49-nendo Kankyocho itaku chosa)). Text in Japanese. Kankyo Kenkyu (Environ. Res.), no. 10:58-74, Aug. 1975.*

Environmental improvement expenditures were calculated from a pilot model for environmental conservation. An average cost for pollution elimination was postulated, and expenditures for lowering a pollution factory by one unit were calculated for construction, amortization, and operation. The pilot model consists of two sectors: Economic activities sector: Macromodel of Japanese economy, including factors based on industrial production, energy expenditures, fuel consumption. Pollution factor sector, consisting of 5 pollution factors sulfur oxides; nitrogen oxides; biological oxygen demand; general wastes; industrial wastes), their causes, treatment, amounts of emission, and target standards. External factors such as population changes and automobile usage are also included. Industries were divided into 20 groups for purposes of setting up a matrix for environmental improvement expenditures. Based on 1972 data, operational costs for desulfurization were calculated to be $410/S ton (direct desulfurization), and $769/S ton (indirect desulfurization), with the weighted averaged value being $609/S ton. Averaged construction costs for direct and indirect processes were calculated to be $5100/S Kg/hour. Averaged amortization costs were calculated to be $118/S ton.

1972

54038 **APTIC NO. 77711**

Commoner, Barry

MILJOFORUM-ENVIRONMENT FORUM: THE MEANING OF THE ENVIRONMENTAL CRISIS. *United Nations Conference on the Human Environment, Stockholm, Sweden, 15p., June 5, 1972.*

The purpose of the Conference was to establish an understanding that the environmental crisis was common to all people on the planet, so that action could be taken to relieve and offset its harmful effects. The global ecology is interwoven with all other crises on the planet, including war, starvation, famine, and racial tensions. Pollution levels are linked to economic gains which require an increase in energy use. New technologies are adapted to natural environmental processes, so they lead to environmental pollution, and constitute the driving force behind the crisis. The population explosion is also a major problem which needs to be reversed in order to conserve energy. A massive reconstruction of the economic systems of industrialized and developing nations will result in great political changes, as it raises questions of racial competition for survival.

STANDARDS AND CRITERIA

1975

54039 **APTIC NO. 78061**

Andrews, J. W., P. Bonnifay, B. J. Cha, J. C. Barbier, D. Douillet, J. P. Franck, and C. Raimbault

GASOLINE POOL: WHAT IT NEEDS. *Hydrocarbon Process., 54(5): 69-73, May 1975. 3 refs.*

The effect of regulations controlling the lead content of gasoline on refinery processes is discussed. The upgrading of gasoline pool properties (octane number and volatility characteristics) for no-lead and low-lead gasolines is discussed in terms of three key processes: continuous regenerative catalytic reforming once-through isomerization, and Dimersol production of isohexenes. In the United States, catalytic reforming is likely to be combined with other processes to upgrade the pool octane number and ensure satisfactory volatility characteristics.

54040 **APTIC NO. 78008**

Bardoej., Z.

MACS IN CZECHOSLOVAKIA. *J. Hyg. Epidemiol., Microbiol. Immunol. (Prague), 19(2):148-162, 1975. 28 refs.*

The development of maximum allowable concentrations (MACs) in Czechoslovakia are reviewed. The list contains 101 substances. For every substance two values are given: the first for time weighted average, the second as a peak limit that should not be exceeded. The last is two to five fold of the first. Numerous values are based on observation in Czechoslovak industry. Only when such data were not available were field studies and experiments on animals carried out abroad evaluated. The mean value must prevent damage from long term exposure and the peak one must prevent hazard of acute symptoms. In some compounds discomfort is tolerated as in the case of sulfur dioxide, ammonia, and styrene. Both values are tabulated for all 101 substances.

54041 **APTIC NO. 77673**

Bruckman, L., R. A. Rubino, and T. Helfgott

RATIONALE BEHIND A PROPOSED CADMIUM AIR QUALITY STANDARD. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 48 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-31.7.)*

The rationale used to formulate a proposed cadmium air quality standard is described. The proposed standard of 0.3 micrograms/cu m is based on a daily environmental Cd mass balance for a non-occupationally exposed adult from all exposure routes, but does not consider the possible role of the entry of airborne Cd into the food chain and drinking water supplies, which may be of considerable importance, but which cannot be quantified at this time. Indoor Cd concentrations should be kept below the proposed standard since most people spend the majority of their time indoors. This may require controlling indoor emission sources of Cd, such as cigarettes, in public places. Heavy smokers and individuals constantly in their vicinity, especially in poorly ventilated rooms, are especially susceptible to developing elevated Cd body burdens due to the large amount of Cd in both mainstream and sidestream smoke. A suspended particulate control strategy aimed at lowering air Cd concentrations reduces the submicron fraction since these small particles pose the greatest health hazard. (Author summary modified)

54042 **APTIC NO. 77997**

Pace, Thompson G., III and Walter H. Stevenson

THE NATIONAL STATUS OF AIR POLLUTION BY TOTAL SUSPENDED PARTICULATES AND FUTURE PROSPECTS FOR CONTROL. *Preprint, Air Pollution*

Control Assoc., Pittsburgh, Pa., 19p., 1975. 20 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-25.1.)

An overview of the attainment status of the National Ambient Air Quality Standards for particulate matter is presented. Major problems related to the attainment of particulate standards include conventional stationary and mobile sources, high urban background concentrations, and rural fugitive dust problems. The urban background problems are being experienced in many areas of the United States and are associated with particulate emissions from tire and pavement wear, windblown dust, street dust caused by traffic flow, and construction activities. The rural problems are associated with farm land dust and unpaved roads and generally occur in the arid southwestern states. As conventional stationary sources continue to reduce particulate emissions, it may be necessary for future control efforts to be redirected toward fugitive dust sources. (Author abstract modified)

54043 **APTIC NO. 78347**

Strelow, Roger

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES OF AIR POLLUTION. OPACITY PROVISIONS; REQUEST FOR PUBLIC COMMENT. *Federal Register, 40(78):17778-17781, April 22, 1975. 10 refs.*

The opacity standard applicable to new asphalt concrete plants is discussed. The opacity test method was revised to extend the time over which opacity observations are made to six min. The use of the average of 24 observations, taken at 15 sec intervals, will preclude a single high reading from being cited as a violation. Observations with a transmissometer at several asphalt concrete plants were used in reconsidering the opacity standard. Particle shape has negligible effect on the cumulative angular scattering patterns of a group of irregular particles due to the averaging effects of random particle motion and orientation in space. This effect leaves mean particle size as the principle particle related variable affecting the mass-opacity relationship. The mass mean diameter of particles emitted by asphalt concrete plants equipped with baghouses or venturi scrubbers varies only within a narrow range (1 to 6 micron), and this range is outside the region (less than 1 micron diameter) of maximum light scattering for asphalt concrete plants. The effect of this variation in particle diameter represents about a 6% variation of opacity. This effect is accommodated by the tolerance allowed by establishment of the opacity standard at a level well above the equivalent mass standard. Stack diameter affects opacity directly because it governs the path length through which the light is attenuated. It is recommended that the opacity standard not be changed. A special provision will account for any extreme circumstances where opacity may fall outside the projected bounds.

54044 **APTIC NO. 77862**

Environmental Protection Agency, Washington, D. C.

AIR POLLUTION ASPECTS OF SLUDGE INCINERATION. *Rept. EPA- 625/4-75-009, 15p., June 1975. 12 refs.*

The capacity of existing municipal wastewater sludge incinerators to meet EPA New Source Performance Standards (NSPS), especially for emission of particulate matter, is reviewed. Pollutant organics, metals, and gases are also discussed. Existing facilities are basically adequate to meet the most stringent particulate emission control regulations now enforced by any state or local control agency. Impingement scrubbers do not meet current EPA standards, but would do so with minor alterations of regulation of the fuel burning rate. (Author conclusions modified)

54045 **APTIC NO. 78316**

Tokyo Metropolitan Government (Japan), Pollution Bureau

PRESENT STATUS OF AND FUTURE TOPICS FOR AUTOMOBILE EXHAUST GAS REGULATIONS. *(Jidosha haishutsu gasu kisei o meguru genjo to kongo no kadai). Text in Japanese. Tokyo Koho (Tokyo Inf.), 26(2):16-21, Feb. 1975.*

The impasse reached by Japanese Environmentalists and automakers in trying to set stringent automotive pollution standards for 1976 in Japan is described with respect to its impact on Tokyo. The permissible 1975 automotive emissions were set as follows: carbon monoxide (2.1 g/km); hydrocarbons (0.25 g/km); and nitrogen oxides (1.2 g/km, 1/2 of the present level). In 1976 the emission of nitrogen oxides should be 0.25 g/km (1/10 of present level); other emission levels remain the same. In a hearing held in June 1974, automobile makers cited technical difficulties, and desired a postponement of enforcement of the 1976 regulations for nitrogen oxides. Of the automakers, Honda Giko and Toyo Kogyo were most advanced in pollution control research, while Nissan and Toyota were among the laggards. Automobile ownership in Tokyo reached the 2.62 million mark in September 1974. In 1973, in Metropolitan Tokyo, the yearly average value of nitrogen oxides was over 0.03 ppm. By 1980, the projected total emission of nitrogen oxides would reach 142,000 tons, but the permissible emission level should be 25,000 tons. With the modified recommendations for 1976 (0.6 g/km for smaller vehicles (below 1 ton); 0.85 g/km for larger vehicles), there is no way of attaining environmental standards by 1980, except by an unrealistic 50% reduction in automobile usage. Community action for stricter standards has come from a council organized by heads of seven cities (Tokyo, Kawasaki, Yokohama, Nagoya, Kyoto, Osaka, Kobe) and from a committee consisting of representatives from 43 Metropolitan Tokyo residential civic organizations.

1974

54046 **APTIC NO. 77918**

Grennfelt, Peringe and Tomas Lindvall

IS HYDROGEN SULFIDE A SUITABLE ODOR INDEX FOR SODA BOILER WASTE GASES. *(Ar svavelvate ett lampligt luktindex for sodapannegaser)? Text in Swedish. Swedish Water and Air Pollution Research Lab. (Goteborg), 12p., Dec. 1974. 14 refs.*

The suitability of using hydrogen sulfide as an odor index for emissions from kraft pulp mills is discussed in relation to Swedish emission regulations. Recent Swedish emission regulations imply that H2S is the dominant odorant in flue gas from recovery furnaces and that a change in its concentration will lead to a corresponding change in odor strength. However, the odor threshold concentration of pure H2S is shown to vary much more than that of other compounds with a corresponding odor strength, and this variation is still more pronounced in flue gases from recovery furnaces and lime kilns. Hydrogen sulfide may be a suitable odor indicator at some recovery furnaces, while in other cases its value as an odor index is doubtful.

LEGAL AND ADMINISTRATIVE

1975

54047 **APTIC NO. 75926**

PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio

ESTABLISHMENT OF A NON-EPA USER SYSTEM FOR STATE IMPLEMENTATION PLANS (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-*

1001, Task 4, Rept. EPA-450/3-75-049, 74p., Jan. 1975. 3 refs.

NTIS: PB 243633/AS

A survey was conducted among nine selected state air pollution control agencies to determine their current practices and projected needs relating to direct state access to Environmental Protection Agency data bases. The results were extrapolated to cover the nation by using the State Air Data Information Survey. The requirements for direct access to air data bases were not overwhelming. A preliminary cost survey was conducted for a projected method for allowing state agencies to have direct access to the data bases, and typical state costs are tabulated for different data networks. (Author abstract modified)

54048 **APTIC NO. 77829**

Aymar, Arthur A.

ARIZONA KEY MODE AUTO INSPECTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-42.4.)*

Arizona's mandatory inspection/maintenance vehicular emissions control program which utilizes the key mode loaded test procedure is described. Implementation of a mandatory inspection plan for motor vehicles by July 1, 1975 is planned for Maricopa and Pima counties which contain the metropolitan areas of Phoenix and Tucson. Tests on over 17,000 vehicles reveal a 20% failure rate in terms of carbon monoxide and nitrogen oxide emissions. The mandatory periodic vehicular inspection program is to be eventually extended to the rest of the state if conditions warrant.

54049 **APTIC NO. 78118**

Bawa, Vijay S.

ON OPTIMAL POLLUTION CONTROL POLICIES. *Manage. Sci., 21(12):1397-1404, Aug. 1975. 5 refs.*

Economists have advocated the use of taxation as an economically efficient means of control to implement environmental protection policy. Evnironmental problems, however, do not always develop smoothly and gradually but are often characterized by infrequent serious crises that require rapid, but temporary, changes in the controlling mechanism. Tax policy is inappropriate for such crises, but direct controls can be implemented rapidly to handle such emergencies. Simple stochastic models to represent the physical environment are used to show that the pollution control policy which minimizes total social costs is a mixed policy in which taxes are used to control the long-run equilibrium level of pollution and direct controls are used in short-term emergencies to maintain the pollution at a satisfactory level. Direct controls alone may be the optimal way to control pollution in some special circumstances.

54050 **APTIC NO. 77695**

Bonam, William L., William F. Fuller, and James A. Williamson

EMISSION ANALYZER CERTIFICATION TO EPA CONTINUOUS MONITORING REQUIREMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-60.1.)*

The certification procedures and acceptable performance criteria by the Environmental Protection Agency for continuous emissions monitoring systems are described. Problem areas encountered are adherence to the correct procedures, improper calibration system design and materials selection, and large confidence intervals as a result of sampling technique and reference method accuracy. Important factors in obtaining successful certification results are basic analyzer design, or site training for sampling contractors, field verification of calibration standards, and use of a field chemist to verify sampling results on site. (Author abstract modified)

54051 **APTIC NO. 77682**

Bright, R., K. Croke, J. Hoover, K. Hub, D. Schregardus, and P. Walker

AN ECONOMIC AND ENVIRONMENTAL ASSESSMENT OF AIR QUALITY POLICIES FOR ELECTRIC UTILITIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-29.4.)*

An economic and environmental analysis of alternative sulfur oxide control policies and compliance deadlines for electric utilities in the Midwest is presented. The methodology analyzes the cost to individual power plants of alternative methods of compliance and proceeds forward over the time frame of 1975-1982 to allocate supplies against demand in response to both a policy scenario and a variance priority scheme. Supply and cost models are developed for Western low sulfur coal, flue gas desulfurization, and generating system reliability. If current State Implementation Plans are enforced in 1975, 15% of the regional capacity would be left out of compliance by 1982. Enforcement only of primary ambient standards instead of the Implementation Plans would allow complete compliance by 1982 at 30% less cost to the utility industry. Delay of enforcement causes not only some delay in compliance but also causes Western low S coal utilization to increase at the expense of the scrubber industry. The alternative policies analyzed cause power production costs to increase 2-3 mills/kw hr. Scrubber utilization is sensitive to price. (Author abstract modified)

54052 **APTIC NO. 77687**

Byrd, Eldon A., Sherman Gee, and Orsell M. Meredith

SURVEY OF DEPARTMENT OF DEFENSE AEROSOL TECHNOLOGY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-32.3.)*

Air pollution monitoring and control technology at Department of Defense (DOD) laboratories and centers was surveyed to determine where applicable technology exists. The effort developed effective liaison between several DOD laboratories and the Environmental Protection Agency (EPA). Aerosol hardware items and technical reports are transferred which avoids duplication of DOD efforts by EPA in these areas. The survey benefits the EPA through improved access to the technology base in the DOD/Atomic Energy Commission (AEC) laboratory system as well as providing EPA with specific technological assistance in the form of hardware technology and DOD/AEC laboratory capabilities. (Author abstract modified)

54053 **APTIC NO. 77877**

Callaghan, D. J. and M. Feldstein

THE CONTROL OF GASOLINE VAPOR EMISSIONS AT SERVICE STATIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-07.1.)*

A program for the control of gasoline vapor emissions at service stations in the San Francisco Bay area is described. In 1972 the Bay Area Air Pollution Control District undertook to regulate these emissions under the provisions of its permit system. The regulation provided that two phases of control were to be instituted. The first phase dealt with the control of emissions from underground storage tanks, and the second phase dealt with the control of emissions from motor vehicle tanks. The regulation provided for at least 90% control of vapor emissions from both sources, with phase I to be effective by July 1, 1973 and phase II to be effective by January 1,

1974. As the program developed, it was recognized that more time was needed to develop the technology for vapor control on delivery of fuel to motor vehicles, and the date for the final installation of an appropriate gasoline delivery nozzle was changed to January 1, 1976. The technology for underground storage tank control is well known, and presently 95% of the gasoline delivered to service stations in the area is effectively controlled by vapor balance systems. (Author abstract modified)

54054 **APTIC NO. 78054**

Decker, G. A. and S. Louie

PEOPLE - THE KEY TO TODAY S EFFLUENT CONTROL NEEDS. *Pulp Paper Can., 76(5):106-109, May 1975. 3 refs.*

The role of personnel in achieving adequate control of air and water pollutants generated by the kraft pulping industry is discussed. Topics covered include: the development of proper attitudes and technical expertise among mill personnel so that sophisticated effluent control systems can be operated efficiently, the provision of a continuous monitoring program, and the maintenance of good relationships and communications with regulatory agencies. Management s commitment to this approach is discussed in relation to the costs involved.

54055 **APTIC NO. 77846**

Freed, Charles N.

UNLEADED GASOLINE ENFORCEMENT PROGRAM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 9p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-54.6.)*

The methods that the Environmental Protection Agency (EPA) use to detect and prosecute violators of the unleaded gasoline regulation are discussed. The regulations require that unleaded fuel be offered for sale at all gasoline stations located in suburban and urban areas that sell more than 200,000 gallons of gasoline/yr and at all rural stations pumping 150,000 or more gallons/yr. Unleaded gasoline cannot exceed 0.05 g/gallon of Pb nor 0.005 g/gallon of phosphorus. Environmental Protection Agency personnel inspect retail gasoline stations and sample and test unleaded gasoline for contamination. The penalty assessment and mitigation process, initiated upon the detection of a violation, is discussed with examples provided of the amount of the penalty assessed for specific violations. The legal remedies available to a party that wishes to contest either the liability determination or the monetary amount of the penalty are explained. The instances of contamination occurring in the field are not as high a level as estimated by some petroleum industry and EPA personnel prior to the commencement of the program. (Author abstract modified)

54056 **APTIC NO. 77799**

Furuhama, S.

PROBLEMS ON RECENT EXHAUST EMISSION CONTROL SYSTEMS. *(Saikin no haiki taisaku ni taisuru mondaiten). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(8):757-758, Aug. 1975.*

The general trend in automobile engine development in Europe and USA is the priority placed on fuel economy. A few years ago, environmental pollution control was the primary concern. However, in the Japanese automobile industry, pollution control is still the primary concern, and fuel economy is secondary. For the achievement of pollution control, fuel economy is often sacrificed. This makes it very difficult for Japanese automobiles to compete in the international market. The reevaluation of severe automotive exhaust emission standards imposed on Japanese automobiles is discussed as well as the general trend in pollution control measures.

54057 **APTIC NO. 78321**

Hansen, Douglas C.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES AND NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS: DELEGATION OF AUTHORITY TO STATE OF WASHINGTON. *Federal Register, 40(63):14632-14634, April 1, 1975.*

Authority was delegated to the State of Washington to enforce Environmental Protection Agency (EPA) performance standards for new stationary sources and emission standards for hazardous air pollutants. The EPA Administrator retains concurrent authority to inplement and enforce the standards. The eleven categories of new sources covered are incinerators, Portland cement plants, nitric acid plants, sulfuric acid plants, asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The three hazardous air pollutants covered are asbestos, beryllium, and mercury. The text of the letter delegating authority is included.

54058 **APTIC NO. 78338**

Hansler, Gerald M.

NEW YORK: IMPLEMENTATION PLAN FOR CONTROL OF INDIRECT SOURCES OF AIR CONTAMINATION; PROPOSED REVISION. *Federal Register, 40(66):15094-15095, April 4, 1975.*

A new regulation dealing with indirect sources of air pollution has been adopted by New York State. It corrects the deficiencies of the previous plan, which was disapproved by the Environmental Protection Agency. The new regulation provides for preconstruction review of parking facilities, airports, and highways. Modifications of these facilities are also included, and there are separate provisions for urban and nonurban areas. For highway sections and airports, the preconstruction review includes a determination that the national standards for carbon monoxide, photochemical oxidants, and nitrogen dioxide will not be exceeded. The applicable national standards for a parking facility are those for carbon monoxide. The state regulation is more stringent than required for compliance with the Clean Air Act.

54059 **APTIC NO. 78261**

Heigl, Anton

WHAT EFFECT HAS THE TAX DEDUCTION? *(Wie wirkt die Steuerabschreibung)? Text in German. Umwelt (Duesseldorf), 5(4): 18-21, 1975. 4 refs.*

Responses given by 575 chemical companies, representing 71% of all employees in West Germany, to a questionnaire concerning the effects of the special tax deduction on environment protection- related investments are analyzed. Some 58% of these companies made environmental protection-related investments during recent years, 76% of which did so voluntarily. Seventy percent of these companies would have made voluntary investments even without the incentive of tax deductions. This percentage was 48% for all companies. The majority of the companies preferred an immediate write-off to a tax deduction. Sixteen percent of the companies were not aware of the tax deduction provisions at all.

54060 **APTIC NO. 77824**

Jarzebski, Stefan

THE ACTIVE POLICY OF AIR PROTECTION ON THE AREA OF A GREAT MUNICIPAL AND INDUSTRIAL AGGLOMERATION ON THE EXAMPLE OF THE UPPER SILESIAN INDUSTRIAL REGION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-22.5.)*

Air resource management policies for the upper Silesian industrial region of Poland are reviewed. Emission standards are initially established for plants situated in regions where health standards are being exceeded, particularly for dust and gaseous contaminants, except sulfur dioxide and nitrogen oxides from burning processes. Emissions of SO2 and NOx from burning processes required for power production are separately considered. Emissions from each plant in the region are checked every year, and justified sums of money spent by the plant for air pollution abatement are refunded. A regional fund also exists for municipal undertakings in the area of air pollution abatement.

54061 **APTIC NO. 77769**

Karasek, F. W. and O. Hutzinger

ENVIRONMENTAL CHEMISTRY IN THE NETHERLANDS. *Res./Dev., p. 41-42, 44, 46, Sept. 1975. 8 refs.*

Environmental control activities in the Netherlands are reviewed. Pollution activities center in government sponsored laboratories and to a lesser extent in universities and industries. Research focuses not only on pollution originating in areas of intense industrial activity but on pollution carried in by the Rhine and its tributaries. Course work in universities deals with the over all picture, including ordinary chemistry, meteorological factors, transport phenomena, accumulation mechanism, the chemical, photochemical and biochemical reactions occurring in the environment, the chemical classes of pollutants, animal metabolism, and environmental and toxic effects.

54062 **APTIC NO. 77995**

Keeling, Billy F., Robert J. Schreiber, Jr., and James H. Long

MISSOURI S WORKABLE FUGITIVE DUST REGULATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-25.5.)*

The development and implementation of Missouri s fugitive dust regulation is described, with particular emphasis on its effectiveness in controlling emissions from industries which do not readily lend themselves to process weight regulations. The versatility and ease of application of the regulation is dependent on the use of the microscope to clearly identify the nature and source of the material creating the nuisance. Specific examples of successful application of the regulation are cited for rock quarrying operations, the wood products industry, cotton gins, large grain elevators, and an iron pelletizing operation. (Author abstract modified)

54063 **APTIC NO. 78130**

Lillis, Edward J. and Jean J. Schueneman

CONTINUOUS EMISSION MONITORING: OBJECTIVES AND REQUIREMENTS. *J. Air Pollution Control Assoc., 25(8):804-809, Aug. 1975. 2 refs.*

The benefits of the continuous emission monitoring regulations proposed by the Environmental Protection Agency are described. The regulations require existing and new sources within certain specified source categories to install, operate, and maintain continuous emission monitoring systems. Continuous emission monitoring provides a full time data base for both the control agency and the source operator. The systems permit control agencies: to evaluate nuisance conditions; to develop a more comprehensive air resource management plan for the community; to determine the specific emissions of each major source within the community; and to develop more accurate relationships between ambient ground level concentrations and emission rates. The systems provide process operators with a tool to assist them in controlling plant operating conditions so as to achieve minimum emission, improve operating, efficience, and to reduce costs.

54064 **APTIC NO. 78319**

Manko, Joseph M.

PENNSYLVANIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(66):15095-15096, April 4, 1975.*

The Clean Air Act requires each state to submit a plan which provides for the attainment and maintenance of the national ambient air quality standards throughout the state. Each such plan is to contain legally enforceable compliance schedules setting forth the dates by which all stationary and mobile sources must be in compliance with any applicable requirement of the plan. It is proposed that a revision to the compliance schedule portion of Pennsylvania s plan be approved. The revision would establish April 30, 1975 as the date by which a power plant in Armstrong County must attain compliance with the emission limitation of the State Implementation Plan.

54065 **APTIC NO. 78336**

Manko, Joseph M.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS: COMMONWEALTH OF VIRGINIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register , 40(57):13002-13003, March 24, 1975.*

The Clean Air Act requires each state to submit a plan which provides for the attainment and maintenance of the national ambient air quality standards throughout the state. Each such plan is to contain legally enforceable compliance schedules setting forth the dates by which all stationary and mobile sources must be in compliance with any applicable requirement of the plan. It is proposed that certain revisions to the compliance schedule portion of the plan submitted by the Commonwealth of Virginia be approved. Each proposed revision establishes a date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. The revisions proposed for approval are included.

54066 **APTIC NO. 78113**

Martin, Werner

LEGISLATIVE AIR POLLUTION STRATEGIES IN VARIOUS COUNTRIES. *Clean Air, 9(2):28-31, May 1975. 2 refs.*

Air pollution control standards and strategies for the major industrial nations throughout the world are compared. Only the industrialized countries have developed air pollution control legislation. The distance between industrial pollution sources and populated areas is regulated in France, the Soviet Union, Hungary, Poland, and Romania. The best practical means approach, which requires use of the best available technology, is used in Great Britain, Sweden, and Canada. The air quality management approach is used in the Soviet Union, Czechoslovakia, and East Germany. Japan and most of Western Europe, except Great Britain, use both air quality and emission standards. The regulations that would apply to a hypothetical sulfur dioxide source in each of nine countries are compared.

54067 **APTIC NO. 78323**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. *Federal Register, 40(44):10228-10233, March 5, 1975.*

As required by the Clean Air Act, the Environmental Protection Agency (EPA) has reviewed and commented in writing on Federal agency actions impacting the environment during January 1975. Draft and final environmental impact statements, proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon are listed with a summary of the nature of EPA s comments.

54068 **APTIC NO. 78135**

Parobeck, Paul S.

EFFECT OF THE 2.0 MG/M3 COAL MINE DUST STANDARD ON UNDERGROUND ENVIRONMENTAL DUST LEVELS. *Am. Ind. Hyg. Assoc. J., 36(8):604-609, Aug. 1975. 3 refs.*

Environmental dust levels currently existing in underground U. S. Coal mines are analyzed and compared to levels existing prior to Dec. 30, 1972. The 1969 Federal Coal Mine Health and Safety Act requires that the average concentration of respirable dust in the active workings of a mine be maintained at or below 3.0 mg/cu m and that effective Dec. 30, 1972, the 3.0 mg/cu m be reduced to 2.0 mg/cu m. At the end of 1973, approximately 94% of the underground coal mining sections are in compliance with the 2.0 mg/cu m dust standard. Approximately 95% or 37 of the 39 occupations known as face workers in the coal extracting sections have an average concentrational value for all samples submitted in 1973, equal to or less than 2.0 mg/cu m. Compliance with the 2.0 mg/cu m standard reduces the prevalence of coal workers pneumoconiosis and allows coal workers to be employed their entire adult working life without occurrence of the disease. (Author conclusions modified)

54069 **APTIC NO. 78114**

Persson, Goran A.

THE SWEDISH APPROACH TO AIR POLLUTION CONTROL. *Clean Air, 9(2):24-27, May 1975. (Presented at the International Clean Air Conference, Rotorua, New Zealand, Feb. 17-21, 1975.)*

The Swedish Ministry of Agriculture forms environmental policy which is implemented by the National Environmental Protection Board (EPB). The air resource management approach and the best praticable means approach are each used under different circumstances. National guidelines for land use include general guidelines on handling certain types of activities in regional and local physical planning and guidelines for the management of certain natural resources in some parts of the country. Industries of major importance to the management of the country s land and water resources must apply to the government for location permits. Uniform emission standards apply for the entire country, but only the conditions in the individual permit have legal force. Thus the general requirements are known, but flexibility is also possible. The Swedish government subsidizes industrial pollution control investments in existing plants. Swedish emission standards for gasoline fueled vehicles are given. The U. S. 1973 standards have been adopted for the 1976 model year. Priority is given to monitoring the emissions from a representative number of in-use vehicles. If a group of vehicles with excessive emissions is identified, more complete durability tests may be required. As oil is the only important fossil fuel in Sweden, the emission of sulfur dioxide is considered to be the major air pollution problem. Burning fuel oil with a sulfur content higher than 2.5% is prohibited. A long range transport of sulfur compounds from other parts of Europe also affects Sweden s air pollution situation.

54070 **APTIC NO. 78320**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: PENNSYLVANIA: APPROVAL OF PLAN REVISION. *Federal Register, 40(63):14595-14596, April 1, 1975.*

The Commonwealth of Pennsylvania submitted to the Environmental Protection Agency a proposed amendment to the City of Philadelphia portion of the approved Pennsylvania Implementation Plan for the attainment and maintenance of the national ambient air quality standards for sulfur dioxide. The major provision of the proposal would postpone, until March 31, 1975, a decrease in sulfur-in-fuel oil limits from 0.5% to 0.3%. This decrease had been scheduled for October 1, 1973. There is also a provision for allowing noncommercial fuel users to average stack emissions throughout a facility if it can be shown that air quality will not be adversely affected. An existing Pennsylvania regulation which limits sulfur dioxide emissions on a combustion unit basis would mitigate any enforcement problems caused by the averaging provision. The implementation date is deferred to allow a detailed air quality analysis to be completed in Philadelphia in order to determine the need for going to the lower sulfur-in-fuel level. The proposed amendment was approved.

54071 **APTIC NO. 78299**

Ravan, Jack E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: MISSISSIPPI: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(88):19656-19659, May 6, 1975.*

The Clean Air Act requires each state to submit a plan which provides for the attainment and maintenance of the national ambient air quality standards throughout the state. Each such plan is to contain legally enforceable compliance schedules setting forth the dates by which all sources must be in compliance with any applicable requirements of the plan. The proposed schedules for Mississippi are given and proposed as an amendment to the federal regulations. The schedules establish dates by which individual air pollution sources must attain compliance with an emission limitation of the state implementation plan.

54072 **APTIC NO. 77821**

Renner, Fred H., Jr., John Eagles, and David Lynn

DEVELOPMENT OF A MANPOWER PLANNING MODEL FOR AIR POLLUTION AGENCIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-13.1.)*

A computerized model for estimating the manpower requirements of nonfederal air pollution control agencies and for projecting the effects on manpower levels of various policy options and decisions is described. The model is aimed primarily at states rather than urban areas and uses about 40 functional activities. It is based as much as possible on direct air pollution characteristics such as a number of sources and level of monitoring activity. The manpower levels projected for each state are primarily those which are necessary for one central agency to handle all of the air pollution activities within the state. Therefore, the manpower requirements projected for each state from the model must be reviewed in light of the actual character of the air pollution control activities of the state.

54073 **APTIC NO. 77639**

Rubin, Edward S., Robert W. Dunlap, Cynthia B. Wilson, and Roger C. Westman

EFFECT OF AMBIENT CARBON MONOXIDE MEASUREMENT ERRORS ON TRANSPORTATION CONTROL STRATEGY REQUIREMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.2.)*

The effects of ambient carbon monoxide measurement errors on the transportation control plan for Pittsburgh are analyzed. Errors were potentially attributable to problems of instrument calibration and maintenance and to a failure to correct for water vapor interference. The latter effect was estimated to have resulted in a systematic over-statement of all CO data prior to August 1973. This, in turn, exerted substantial implications for transportation control plan strategies which called for emission reduction measures beyond new car controls to attain ambient standards for CO. (Author summary modified)

54074 **APTIC NO. 78288**

Shimono, S.

AGGREGATE CONTROL OF AIR POLLUTION. CIRCUMSTANCES OF AMENDMENT OF AIR POLLUTION CONTROL LAW. *(Taiko osen no soryo kisei. Taiki osen boshiho kaisei no keii). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 12(8):1-13, April 1975.*

On June 1, 1974, a law to amend the Air Pollution Control Law for aggregate pollutant volume control was passed and was effective November 30, 1974. Before this step was taken, local governments carried out their own control systems. Kanagawa applied simple reductions of emission by stages in 1970. Osaka s project team came up with the proposal of setting up an environmental tolerance. Mie established a control standard for factories according to their scale and fuel consumption. The standard was based upon the relationship between each pollution source and pollution, simulation studies, computer calculations, and diffusion theory. Examples of controls in other prefectures, such as Fukui, Kyoto, Okayama, Yamaguchi, Oita, and Chiba, as well as the cities of Kawasaki and Kobe are also given. In May 1973, environmental standards for nitrogen dioxide and photochemical oxidant were determined, and a new environmental standard for sulfur dioxide was established. These standards are to be achieved within 5 yr. The NO2 standard for large cities must be met within 8 yr. Many areas have four to five times more SO2 than the new environmental standard (daily average of hourly values less than 0.04 ppm and hourly figure less than 0.1 ppm).

54075 **APTIC NO. 78331**

Smith, C. V., Jr.

WASHINGTON: APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(77):17597-17598, April 21, 1975.*

The Clean Air Act requires each state to submit a plan which provides for the attainment and maintenance of national ambient air quality standards throughout the state. Approval is proposed for ten compliance schedules and variances as revisions of the State of Washington s State Implementation Plan. Disapproval is proposed for two others which extend beyond the attainment date for national primary ambient air quality standards. The disapproval is being proposed because the information available for consideration fails to demonstrate that a final compliance date extension will not impact national ambient air quality standards with the applicable air quality control region. Each compliance schedule establishes a new date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. The sources and dates are listed.

54076 **APTIC NO. 78332**

Smith, C. V., Jr.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: OREGON: APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(75):17157-17158, April 17, 1975.*

The Clean Air Act requires each state to submit a plan which provides for the attaining and maintaining of national ambient air quality standards throughout the state. One proposed compliance schedule is recommended for approval as a revision of Oregon s plan. Disapproval is recommended for three compliance schedules which extend beyond the attainment data for national primary ambient air quality standards. The disapproval is being proposed because the information available for consideration fails to demonstrate that a final compliance date extension will not impact national ambient air quality standards within the applicable air quality control region. Each compliance schedule establishes a new date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. The sources and dates are listed.

54077 **APTIC NO. 78348**

Smith, C. V., Jr.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. DELEGATION OF AUTHORITY TO STATE OF IDAHO. *Federal Register, 40(123):26728-26729, June 25, 1975.*

Authority was delegated to the State of Idaho to implement and enforce the Environmental Protection Agency (EPA) performance standards for new stationary sources. The EPA Administrator retains concurrent authority to implement and enforce the standards. The ten categories of sources are fossil fuel-fired steam generators, Portland cement plants, nitric acid plants, sulfuric acid plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The text of the letter delegating authority is included.

54078 **APTIC NO. 78072**

Smith, Robert D., Leonard P. Winkler, and Alfred M. Levine

AIR POLLUTION BY COMMUTER TRAVEL ON STATEN ISLAND. *Traffic Quart., 29(2):310-312, April 1975. 10 refs.*

A computer model was developed to estimate the emissions reported by commuter usage of the Staten Island transportation system. Four alternate measures to reduce the level of commuter vehicle emissions were analyzed. If bus service on the Island were improved, 25% of the commuters who drive automobiles would switch to buses; if, in addition, the Staten Island Rapid Transit (SIRT), were extended to form a closed loop around Staten Island, 40% of commuters would switch from automobiles to buses and 50% of the switching commuters living near the loop would use it while others living a greater distance would switch to buses. If, in addition, the extended SIRT system also included a subway link to Manhattan, 40% of those commuting by bus would switch to SIRT. The fourth measure assumes that no changes are made in the transportation system, but all commuter cars meet the originally proposed 1975 and 1976 national standards for hydrocarbons, carbon monoxide, and nitrogen oxides. The computer program was used to analyze each of these four measures. The most significant improvement is to require automobiles to satisfy the 1976 emission standards.

54079 **APTIC NO. 78324**

Snyder, Daniel

COMMONWEALTH OF VIRGINIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(51):11895-11896, March 14, 1975.*

The Clean Air Act requires each state to submit a plan which provides for the attainment and maintenance of the national ambient air quality standards throughout the state. It is proposed that certain revisions to the compliance schedule portion of the plan submitted by the Commonwealth of Virginia be approved. Each proposed revision establishes a date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. The revisions proposed for approval are included.

54080 **APTIC NO. 77889**

Spengler, John, Peter Rogers, and Herman Sievering

UNIVERSITY RESPONSE TO NEPA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-63.4.)*

Since the passage of the National Environmental Policy Act (NEPA) and similar requirements in 21 states, there has been an increasing demand for people trained in fields appropriate to the assessment of environmental and social impacts not only of physical projects but also of governmental programs

and policies. The academic community has responded through courses, degree programs, conferences and workshops, research publications, and by direct service to state and federal agencies, as well as public and private organizations. In terms of teaching and research, NEPA has had the largest impacts on the professional schools of law, engineering, public health, planning, and landscape architecture, which have exhibited the most concern about introducing the requirements of impact assessment to their students. Academic training programs face serious reductions in the future. All federally funded Environmental Protection Agency manpower training grants will be terminated within a year or two. Existing and future vacancies at all levels raise serious questions about our nation's abilities to meet and enforce compliance schedules of the states air and water control programs. (Author abstract modified)

54081 APTIC NO. 78156

Stone, Robert S.

CHANGING PATTERNS IN LOCAL ENVIRONMENTAL HEALTH ADMINISTRATION. *J. Environ. Health, 37(6):544-554, May-June 1975. 35 refs.*

Changing patterns in local environmental health administration in California are discussed. A recent law provides for administration of local environmental health programs, traditionally the domain of public health departments, by non-public health organizations. There is a strong health component in many of the new agency's functions including planning and air pollution control. The environmental health staff has opportunities to provide input to general plan elements, housing programs, zoning ordinances, power plant siting, and the environmental impact review process.

54082 APTIC NO. 78329

Strelow, Roger

PART 61 -- NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. DELEGATION OF AUTHORITY TO STATE OF WASHINGTON. *Federal Register, 40(81):18169-18170, April 25, 1975.*

Authority was delegated to the State of Washington to implement and enforce the national emission standards for hazardous air pollutants for stationary sources located in the state. All information required to be submitted to the Environmental Protection Agency must also be submitted to the Department of Ecology of the State of Washington. The appropriate address is contained in the amended section of the Code of Federal Regulations, which is included.

54083 APTIC NO. 78337

Strelow, Roger

TEXAS: STATUS OF OXIDANT CONTROL STRATEGY PLAN. *Federal Register, 40(57):13025-13026, March 24, 1975.*

The status of various regulations for attainment of the primary standard for photochemical oxidants in Texas is discussed. The U. S. Circuit Court of Appeals required that the Environmental Protection Agency defer regulations in the Houston-Galveston Region that account for at least 0.9% reductions in hydrocarbon emissions because of questions concerning emission data. The Court pointed out that the 0.9% could be supplied, for the time being, by deferral of a regulation on stage II vapor recovery, because the Court required the Agency to reconsider that regulation for other reasons. The EPA has taken no steps to enforce the regulation. The Court stated that, unless the Agency decided to defer one of them in place of the stage II vapor recovery regulation, regulations on degreasing operations, state I vapor recovery during the filling of storage tanks, ship and barge controls, vehicle inspection and maintenance, and retrofit of pre-1968 automobiles are valid and enforceable for the Houston-Galveston Air Quality Control Region. Motions for rehearing on ship and barge controls were denied. Shortly after the decision, the Environmental Protection Agency and the Texas Air Control Board began a joint study that will satisfy the requirement of the court to reexamine the accuracy of certain technical data relating to emission reductions and the consequent need for various emission reduction regulations. The study suggests the need for additional controls in most regions if the oxidant standard is to be met.

54084 APTIC NO. 78086

Sullivan, J. L. and R. J. Roberts

EXPERT WITNESSES AND ENVIRONMENTAL LITIGATION. *J. Air Pollution Control Assoc., 25(4):353-361, April 1975. 72 refs.*

Sources and functions of expert witnesses in environmental litigation are discussed. The question of whether a person qualifies as an expert in a particular field is a matter for the discretion of the trial judge. Competent witnesses can be recruited from university faculties, private practitioners, consulting engineers, recent retirees from government and industry, and authors of technical books and articles. At trial the technical expert has two principal functions: to interpret the meaning of technological evidence for the benefit of the fact-finder and to give technical advice to the trial lawyer, particularly during cross-examination of the other side's experts. The subject matter to which expert testimony might be directed includes: causal connection, pollution control technology, breach of emission standards, injury, and damages.

54085 APTIC NO. 77815

Surendorf, Friedrich

THE NEW CLEAN AIR TECHNICAL GUIDE AND THE BRICK AND TILE INDUSTRY. *(Die neue Technische Anleitung zur Reinhaltung der Luft und die Ziegelindustrie). Text in German. Ziegelind. (Weisbaden), no. 4:126-129, April 1975. 5 refs.*

A new Clean Air Technical Guide for gaseous and particulate emissions from the West German brick and tile industry is described. The guide sets forth regulations for emission limiting values in relation to plant operation and emission reduction measures. The guide is expanded to include clay works in addition to the brick and tile industry. Regulations based on specific technical parameters set forth in the guide are expected to guarantee the enforcement of emission limiting values.

54086 APTIC NO. 78335

Svore, Jerome H.

IMPLEMENTATION PLANS: MISSOURI: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, (57):12815-12816, March 21, 1975.*

Revisions are proposed in the compliance schedules submitted by the State of Missouri to the Environmental Protection Agency. Each revision establishes a new date by which an individual source must comply with the applicable emission limitation in the federally approved States Implementation Plan. Three individual sources are affected.

54087 APTIC NO. 78239

Train, Russell E.

SULFUR OXIDE EMISSIONS; NEW MEXICO. PROPOSED REGULATIONS FOR CONTROL; APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 40(86):19211-19218, May 2, 1975.*

Additional regulations are proposed for the control of sulfur dioxide at a smelter in New Mexico, and a date is established for attainment of the secondary national ambient air quality standard. The preamble to the regulations contains a discussion of the air quality in the region, and a description of the proposed regulations. The first section of the regulations requires the control of low-level fugitive emissions, identifies

points of control, and a sets a compliance schedule for achieving control of fugitive emissions. The second section sets an emission limit to be achieved by constant emission control sufficient to meet all National Air Quality Standards. The third section is offered as an alternative to the second section and sets emission limits based on available constant emission control technology, outlines the conditions to be satisfied to allow use of a supplementary control system (SCS), and establishes a compliance schedule for implementing the emission control and SCS. Continuous monitoring of the emission limits proposed in either of the two latter sections is required.

54088 **APTIC NO. 78322**

Train, Russell E.

ENFORCEMENT AUTHORITY: STATE AND FEDERAL ENFORCEMENT OF IMPLEMENTATION PLAN REQUIREMENTS AFTER STATUTORY DEADLINES. *Federal Register, 40(64):14876-14883, April 2, 1975.*

Rules are proposed for the Environmental Protection Agency to follow when ordering a source to comply with a plan requirement after an attainment date. The minimum conditions under which the Agency would be willing to defer to similar enforcement action taken by a state are also included. The substantive requirements are those pursued under the Agency s existing enforcement policy. There is an additional requirement that there be appropriate interim control measures. The procedural requirements involve the preparation of post-attainment date enforcement schedules, public participation, and the essential characteristics of Federal/State coordination.

54089 **APTIC NO. 78334**

Train, Russell E.

CHRYSLER CORP., FORD MOTOR CO., AND GENERAL MOTORS CORP.: APPLICATIONS FOR SUSPENSION OF 1977 MOTOR VEHICLE EXHAUST EMISSION STANDARDS; DECISION OF THE ADMINISTRATOR. *Federal Register, 40(51):11900-11916, March 14, 1975.*

The request of three domestic automobile companies for suspension of the statutory emission standards for hydrocarbons and carbon monoxide in the 1977 model yr was granted. The current Federal interim standards for those pollutants were established as interim standards for that model yr, together with the statutory emission standard of 2.0 g/mi nitrogen oxides for the 1977 model yr. The issues involved in the decision are discussed. They include the progress made in developing technology to control auto emissions, the impact on fuel consumption and on the general state of the economy of increasingly tighter levels of auto emission controls, and the impact on the public health of automobile emissions of carbon monoxide, hydrocarbons, and sulfuric acid.

54090 **APTIC NO. 78340**

Train, Russel E.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. *Federal Register, 40(81):18176-18182, April 25, 1975.*

Regulations are proposed that would require a manufacturer to submit a defect information report when he determines that a specific emission-related defect exists which was not corrected prior to the sale of an affected vehicle or engine to an ultimate purchaser, and which affects five or more vehicles or engines. The proposed regulations would also require manufacturers to report to the Environmental Protection Agency information concerning repairs of emission control systems which they had initiated. Formal action would not be pursued provided that the manufacturer s campaign was effective. Failure to meet specified performance parameters would be evidence that a device or system was defective.

54091 **APTIC NO. 78341**

Train, Russell E.

FUELS AND FUEL ADDITIVES: SUSPENSION OF ENFORCEMENT OF REGULATIONS FOR CONTROL OF LEAD ADDITIVES IN GASOLINE. *Federal Register, 40(81):18217, April 25, 1975.*

The U. S. Court of Appeals for the District of Columbia Circuit granted the Environmental Protection Agency s petition for rehearing a case involving the suspension of EPA regulations controlling the amount of lead additives in gasoline. The regulations require a phased reduction in the average lead content of gasoline produced on a quarterly basis by each refinery. The reduction schedule was to have begun on January 1, 1975. As a result of the Court s action vacating the earlier judgment, the lead regulations are again in effect. However, EPA has decided to continue to suspend enforcement of the regulations until a decision is made by the Court after the rehearing. The outcome of the litigation will not affect the regulations requiring general availability of unleaded gasoline.

54092 **APTIC NO. 78342**

Train, Russell E.

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. WYOMING PLAN REVISIONS. *Federal Register, 40(112):24726-24727, June 10, 1975.*

Several revisions to a subpart of the Code of Federal Regulations dealing with Wyoming are approved. Several paragraphs were deleted because the requirements they dealt with have been satisfied. Fifteen compliance schedule revisions were approved, and one was disapproved. The revisions are listed.

54093 **APTIC NO. 77916**

Williams, Harry D., Warren E. McPhail, John R. Eid, and Thomas J. Geisler

PILOT STUDY OF PROPOSED VEHICLE INSPECTION PROGRAM IN MARION COUNTY, INDIANA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-42.1.)*

A pilot study to determine the need for a vehicle emission inspection program in Marion County, Indiana was conducted. Emission surveys of carbon monoxide and hydrocarbons were performed at state vehicle safety inspection stations, automobile dealerships, and the Indiana State Board of Health Building. Out of a total of 350 vehicles tested, 191 met both CO and hydrocarbon standards (Chicago standards), 18 met only the CO standards, 106 met only the hydrocarbon standards, and 35 met neither standard. A set of standards for Marion County was generated from the emission data using computer programming. A vehicle inspection program to be initiated in July of 1975, with completion of the first inspection cycle 1 yr later, is recommended. Failure rates for 1975 and 1976 model year vehicles and the January 1976 vehicle age distribution appear to be necessary considerations to estimate failure rates for the inspection program.

54094 **APTIC NO. 77957**

Wood, John L. and W. Terry Echols

THE POTENTIAL FOR RELAXATION OF EMISSION STANDARDS IN TEXAS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-22.4.)*

Climatological studies and dispersion modeling (the Air Quality Display Model) were used to investigate the possibility of relaxing emission standards in Texas without endangering the sulfur dioxide air quality standard. The climatological studies of wind speeds and stability classes tended to emphasize the short-term consequences of air quality problems; whereas the dispersion model evaluated all of the various stability, wind direction, and wind speed combinations over an entire season, giving an indication of long-term air quality quality problems. The AQDM showed its greatest capabilities as an annual model. Relaxation of emission standards without endangering the short-term ambient air standards was recommended in some areas at all times (e.g., the northeastern Panhandle) and in others at no times (e.g., the far western part of the state). Simultaneous consideration of the climatological and parametric dispersion modeling conclusions led to combined recommendations for specific areas and periods rather than a single statewide recommendation. Seasonal maps of Texas with these area recommendations for action are provided. Author conclusions modified)

54095

APTIC NO. 77795

Yanagisawa, S. and S. Suzuki

REPORT OF SURVEY TEAM FOR INVESTIGATION OF ACTUAL STATUS OF DEVELOPMENT OF AUTOMATIC MONITORING EQUIPMENT FOR ATMOSPHERIC POLLUTION. 2. SURVEYS IN EUROPE. *(Taiki osen kanshiyo jido keisoku kiki kaihatsu jittai chosadan no chosa katsudo to sono kiroku. 2. Hoo chosa no bu). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(4):339-344, 1975.*

A 2-week survey trip to European pollution control research centers in October 1974 is described anecdotal form from diary entries. The four-man survey team visited Delft (TNO Research Institute for Environmental Hygiene), Stockholm (Swedish National Environmental Protection Board), Berlin (Institut fuer Wasser-Boden und Lufthygiene), Rome (Environmental Programme Coordinating Unit, FAO), London (Headquarters British Calibration Service, Dept. of Prices and Consumer Protection), and Paris (Paris Institute of Health). Of the countries visited, Italy was the least advanced in formulation of environmental protection and pollutant monitoring, but guidelines, rather than legally established standards are the rule. Sulfur oxides and soot particles are monitored constantly in all these countries; nitrogen oxides, ozone, carbon monoxide, and hydrocarbons come next under surveillance. The occurrence of photochemical smog is rare in Europe, because of geographical conditions, so continuous monitoring of nitrogen oxides has not been considered of immediate importance in some of these countries. International cooperation and research is in the offing, since pollutants diffuse across frontiers, but standardization of analytical methods has not been agreed to as yet. Japan is the most advanced country in matters of standardization of standard gases and automatic monitoring equipment, but improvement in training and the securing of more staff and research personnel is needed.

54096

APTIC NO. 77798

Yoshikawa, Hironari

OBSERVATIONS ON ENVIRONMENTAL ASSESSMENT (4). REPORT. ENVIRONMENTAL ASSESSMENT IN OKINAWA. *(Kankyo asesumento o kangaeru (4). Hokoku. Okinawa ni okeru kankyo asesumento). Text in Japanese. Ao To Midori (Blue Green), 4(3):48-57, March 1975.*

The importance of the regional character (topographical and meteorological aspects and flora and fauna) in environmental assessment is discussed, with Okinawa as the example for computer analysis. Okinawa, with its present rapid development, has red soil erosion as an example of environmental destruction. Destruction of coral reefs surrounding Okinawa by the influx of red soil would mean loss of breakwater, and loss of sea-urchin and trepang, which fluorish in the bay-like environment off the coast. The adverse impact by red soil on mangrove forests at river mouths has already appeared. A 3-dimensional analysis of environmental impact was attempted by mesh map analysis of an area of 500 sq m. In a cubic representation, the X-axis is logarithmic geographic scale (G-scale); the Y-axis is logarithmic time scale (T-scale), and the Z-axis represents 4 orders of regional hierarchy, from macroscale (mostly 1st order), to mesoscale (mostly 2nd order), to microscale (mostly 4th order). Macroregions are influenced by annual meteorological conditions, which also determine the natural environment. Second-order mesoregions are influenced by variations within the first order. Third-order regions are geographically compact in location and boundary; in its natural state, each region can support an independent society and economy. The microregion (4th order) is the smallest regional unit; characteristics of each island (size, shape, heights, soil composition, whether coral island or not) are analyzed to determine land and harbor use potentials and assess environmental capacity.

54097

APTIC NO. 78143

Saitama Prefecture (Japan), Environmental Div.

COURSE AND COUNTERMEASURES IN PHOTOCHEMICAL POLLUTION OCCURRENCES IN THE SAITAMA PREFECTURE. *(Saitama-ken Ni Okeru Kokagaku Kogai Hassei No Keika To Taisaku). Text in Japanese. p. 55-63, March 1975.*

A mobile air pollution monitoring vehicle was stationed, 3 wk at a time, at ten locations in the northern part of the Saitama Prefecture from April to November 1974. Oxidant concentrations above the warning level (0.15 ppm) occurred at four of these locations, where measurements were taken in May through September. A maximum oxidant concentration of 0.21 ppm was found. In comparison to the southern part of the prefecture, the frequency of occurrence was low, the duration of oxidant warnings was short, and peak concentrations of pollutants appeared late in the day (5-7 pm). In the Saitama Prefecture, 34 large-scale factories are required to reduce the amount of fuel in soot sulfur dioxide-producing facilities during oxidant alerts. On-site inspections and patrols in 1974 found that 27 factories were enacting fuel-reduction measures during the alerts. Oxidant alerts increased from 7 in 1970 (Tokyo alone), to 288 in 1974 (22 prefectures). Tokushima and Yamaguchi Prefectures were included in the alerts for the first time in 1974, although the total number of alerts nationwide had decreased from 328 in 1973. In 1974, Saitama (29), Osaka (27), Chiba, Tokyo, Kanagawa (26 each), had the greatest number of alerts. The prefectures of Hyogo (4373), Tokyo (2711), Hiroshima (2660), and Saitama (1498) had the greatest number of health impairment cases in 1974. There was a total of 14,725 complaints. In 1974, the first oxidant alerts were announced on April 11, and the last alerts were announced on October 26. Of a total of 288 warnings in 1974, the number of alerts was highest during August (90), June (81), and May (52).

54098

APTIC NO. 78267

Nishinomiya Municipal Office (Japan)

ENVIRONMENT IN NISHINOMIYA IN 1974. *(49 nendo ban Nishinomiya no kankyo). Text in Japanese. 263p., March 1975.*

The environmental pollution data obtained during 1973 are presented. Descriptions of natural and urban environmental conditions, the environmental administration system, environmental protection policy and environmental protection standards and ordinances are reviewed. On the air pollution, data of sulfur oxides, suspended particulates, falling particulates, nitrogen oxides, and oxidant concentrations are given with data of photochemical smog formation and meteorological conditions. As for air pollution control measures, descriptions of environmental standards, legal control procedures, ordinances and regulations, emission standards, air pollution monitoring systems, and emergency procedures for photochemical smog are given. On automobile pollution, concentrations of carbon monoxide, NOx and hydrocarbons are given with data of noise and vibration pollution along major highways. As for water pollution, the pollution data of several rivers are given with a descritption of water pollution control measures and control standards. Data of noise and vibration pollutions caused by factories, construction, air traffic, automobiles and railroad are given with description of control standards. Data on odor pollution and ground subsidence are also given. Data concerning the protection of natural environment and living environment are included.

54099 **APTIC NO. 78301**

Saitama Prefecture (Japan), Environmental Div.

STATUS OF AN COUNTERMEASURES FOR OUTBREAKS OF PHOTOCHEMICAL POLLUTION IN SAITAMA PREFECTURE. *(Saitama-ken ni okeru kokagaku kogai hassei no jokyo to taisaku). Text in Japanese. p. 1-25, March 1975.*

Photochemical pollution occurrences and countermeasures in the Saitama Prefecture in 1974 are reviewed. The first 1974 smog warning was issued on May 17, and the last was announced on September 6. During this time, there were 24 days of predicted smog conditions, [illegible] days of smog warnings, and one day of alert. The maximum oxidant concentration (0.30 ppm) was found in August. There were 1498 reported cases of health damage, a drop from the 6678 reported cases of 1973. Saitama Prefecture has 5 designated areas for pollution surveillance, and 17 oxidant monitoring stations. Inspection patrols are sent to factories to ensure compliance with fuel usage reduction countermeasures during photochemical smog alerts. Ozone concentrations in the atmosphere were measured from altitudes of 300 to 1500 m, in July and August 1974. Oxidant damage to vegetation was monitored with morning glory, spinach, red beet (or Swiss chard) and peanut plants. Air purifiers were installed in public and private schools in December 1974. In 1974, the highest number of occurrences was in the south central pollution surveillance region of the prefecture. With more monitoring stations in operation, more regions of photochemical smog occurrence were found. Patterns of occurrence of high oxidant concentrations in Saitama Prefecture followed the same patterns found in Tokyo and Kanagawa Prefectures. Meteorological conditions accompanying high oxidant concentrations in Saitama included: high temperature; low average wind velocity, especially at noon; low morning visibility; than 3 hr of sunshine; strong temperature inversion; sea breezes; certain types of high pressure patterns above Japan.

1974

54100 **APTIC NO. 78345**

Barhard, Bernard

PRESENT RESEARCH ON ENVIRONMENTAL POLLUTION AND THE HEALTH OF MAN IN ROMANIA. *(Aktualne badania zanieczyszczenia srodowiska i stanu zdrowia ludzi w Rumunii). Text in Polish. Roczniki Panstwowego Zakladu Higi., 25(6):635-639, Dec. 1974.*

A preliminary description is presented of a testing and research program which was started in Romania about three years ago to survey the state of air and water pollution and to obtain statistical data on the health of population. Some of the tasks fall within the framework of the European WHO program and the health survey follows the recommendations of the British Medical Research Council. Investigations of the effects of air pollution are being conducted in regions with a heavy concentration of iron and steel industry, where the principal pollutants are dust with high metallic content, soot, and sulfur dioxide in regions with a heavy concentration of nonferrous metal industry where the main pollutants are lead and sulfur dioxide, and in regions where coal is used almost exclusively for home heating and where the main pollutants are sulfur dioxide, soot, and black smoke. Epidemiological investigations of populations are being conducted in these regions, with a special emphasis on children. Surveys of biological and chemical pollution of some principal bodies of water are being conducted and the health of populations living along the river banks is being surveyed. Computer programs are being written for analysis of gathered data.

54101 **APTIC NO. 78074**

Gourdon, Francois

AUTOMATIC CONTROL OF AIR POLLUTION. *(Le controle automatique de lat pollution atmospherique). Text in French. Entropie, 10(6):32-34, 1974.*

Pollution control networks planned by the French government are surveyed. The networks watch industrial sites and large urban cites and include simple local measurement systems and sophisticated computer controlled networks. A detailed description of an existing system is presented including its different logic function.

54102 **APTIC NO. 77928**

Harris, Theodore R.

PRESENT STATE OF EDP POLICY AND DEVELOPMENT IN EPA. *Environmental Protection Agency, Washington, D. C., OR and D ADP Workshop Proc. No. 1, Bethany, W. Va., 1974. p. 289-295. (Oct. 2-4.)*

NTIS: PB 241 150

Some items currently undertaken by the Management Information and Data Systems Division of the Environmental Protection Agency (EPA) are presented. The House of Representatives has given EPA a directive to conduct a detailed agency-wide study of its automatic data processing (ADP) requirements and to report its findings to the House and Senate Appropriation committees. The Washington Computer Center Project was established to determine the ADP requirements of the agency. The purpose of the interim EDP Resources Project is to obtain an interim computer resource to fill the gap between optimum Systems Inc. and the Washington Computer Center. The goal of the Standard EDP Communicating Terminal Project is to standaridize types of terminals and procurement of the terminals for the agency. A feasibility study has recommended a common data communications network for the EPA with a design linking all users to the two major computer resources of the agency. The milestones for all plans and projects are included.

54103 **APTIC NO. 78364**

Hishida, Kazuo

A PROPOSAL FROM AN ADMINISTRATOR TO TECHNICIANS. *(Gyosei kara gijutsusha e no teigen). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(9):47-50, Sept. 1974.*

Except for some of most progressive prefectures, local public organizations and government bodies lack technical expertise in pollution control techniques. The personnel in charge of pollution problems in such organizations are responsible for evaluating air pollution conditions, assessing public opinion, and advising industries. However, their technical knowledge remains essentially on this level. Without the proper technical qualifications, there is no effective control. The growth of consumption of resources between 1965 and 1970 averaged 35% among the member nations of OECD, but the consumption increase rate was 85% for Japan. Per unit area the energy consumption rate in Japan is 67 times greater than the world average. The projected figure for sulfur oxides emissions for 1985 is 27 million ton/yr, and plastics production is estimated to be 30 million ton/yr. The rate of automobile production growth is over 10% a year.

54104 **APTIC NO. 78141**

Tsuyuki, Tamotsu

BACKGROUND FOR THE ESTABLISHMENT OF THE ENVIRONMENTAL STANDARD FOR HYDROCARBONS AND THE FUTURE DIRECTION FOR EMISSION REGULATIONS. *(Tanka suiso o meguru kankyo kijun settei no haikei to kongo no haishutsu kisei no hoko). Text in Japanese. Preprint, CMC Center and Pollution Control Technical Assn. (Japan), 19p., 1974. (Presented at the Seminar on the Recovery and Treatment* *of Hydrocarbon Vapors, The Newest Techniques for Elimination, Recovery, and Treatment of Hydrocarbon Vapors and the Direction for Emission Control Regulations, Tokyo, Japan, May 23-24, 1974.)*

The changes in the number of photochemical pollution victims over the last four years, the changes in the frequency of oxidant warnings, the 1973 monthly oxidant warnings in various prefectures, and photochemical reaction studies were published by the Battelle Memorial Inst. The investigation of pollutant sources in the Tokyo Bay area, the emission source contributory rates in Tokyo, and photochemically reactive solvents is described. The relationship between photochemical pollution and hydrocarbons, and the future of HC emission source control are discussed. According to the 1970 investigation by the Japan Environmental Agency, 57.3% of HC came from automobiles and other mobile sources, 25.1% from sources involving organic solvents, and 14.8% from petroleum industries involving gasoline and oil. For nitrogen oxides, 39% came from automobiles, 31% from industries, and 21.5% from power generation. There are no all-encompassing control measures since sources are varied. Generally, in the first stage of oil refining and petrochemical industries, storage tanks, pressure tanks, floating roofs, and return methods can be used. In the second stage of gasoline stations, paint industries, printing plants and glue and other adhesive manufacturing plants, conversion of the material, adsorption, condensation and absorption, and combustion can be used.

54105 **APTIC NO. 78019**

Utsunomiya, Makoto

ON THE POLICY OF THE ELIMINATION OF LEAD FROM GASOLINE. *(Gasorin no muenka taisaku ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(7):32-36, July 1974.*

A recommendation was made in August 1970 by the Automobile Pollution Countermeasure Committee of the Industrial Structure Council concerning exhaust. Aspects of the report included: the supplying of unleaded gasoline from April 1, 1974, while decreasing the volume of lead until that time; and manufacturing 1971 model cars for unleaded gasoline. The possibilities of exhaust valve recession problems increased carbon monoxide emissions and hydrocarbons, a decrease in driving performance are mentioned. The oil industry has been gradually reducing the volume of lead in gasoline. However, in order to maintain octane while reducing lead, an 80,000,000-dollar investment in equipment was made by the industry between 1970 and 1972. Measures have been taken to deal with valve recession for engines using propane gas (taxis), large trucks, and buses which use diesel engines. No recession is produced in rotary and 2-cycle engines. A joint study on recession was made by the Agency of Industrial Science and Technology and the automobile and oil industries. It was found that continued use of unleaded gasoline is used under certain conditions, valve seat recession will result in engine-stopping, starting trouble, and decreased power generation. A study of the effect of lead in the atmosphere on health was made by the Tokyo Municipal government, the Ministry of Welfare and Health, the Environmental Protection Agency. Environmental standards for lead are being established by the Central Pollution Countermeasure Council. In October 1972, it was decided to reduce exhaust gases to one-tenth from 1975, and nitrogen oxides to one-tenth from 1976. The Automobile Pollutions Committee report was made on March 25, 1974, after an announcement was made to put off the start of the non-lead gasoline supply scheduled for April 1974; 1) regular gasoline will be lead free from Oct. 1, 1974; 2) for the time being, premium gasoline may contain lead, and 3) all the gasolines will be made lead free in April 1977.

54106 **APTIC NO. 78140**

Miyagi Prefectural Government

MIYAGI PREFECTURE POLLUTION INVESTIGATION DATA, NO. 10 (APRIL 1972 - MARCH 1973), CHAPTER 5: BAD ODOR. *(Miyagi-ken Kogai Shiryo, Dai 5-sho: Akushu). Text in Japanese. p. 477-495, Jan. 1974.*

In the Miyagi prefecture, the facilities and installations subjected to the odor control regulations are: 3 paper and pulp mills, 1 petroleum refinery, 1 petroleum product, 1 chemical fertilizer manufacturer, 43 animal cadaver treatment plants, 10 feed and fertilizer manufacturing plants, 37 sanitation operations, 29 excretion and sewage treatment operations, 10 slaughterhouses, 1798 cattle and stock barns, 5 gas manufacturing plants, and 1 pesticide manufacturing plant, totalling in 1939 installations. Of the 32 facilities investigated between June 1972 and January 1973, most of them fishmeal, fish, and animal bone and entrail treatment plants, 10 facilities received warnings for their inadequate odor control measures, and 4 plants received improvement orders. Most of these plants used water scrubbing, and some used adsorption, electric deodorizers, jet scrubbers, and combustion. The Tohoku University School of Engineering conducted experiments with measurements of ammonia, trimethylamine, acetic acid, butylic acid, propylacid, and isobutylic acid, and evaluated deodorization effects of liquid deodorizers such as 30% hydrogen peroxide, 0.1N sodium hydroxide, and 0.1N hydrogen chloride. The first type gave very good results, and even 1% H2O2 produced some results. The other deodorizers were very unsatisfactory.

1973

54107 **APTIC NO. 77796**

Suita Municipal Government (Japan)

PROGRESS AND STRUCTURE OF POLLUTION CONTROL ADMINISTRATION. *(Kogai gyosei no keika to taisei). Text in Japanese. In: 1972 Pollution White Paper, p. 21-30, March 1973.*

The main developments in pollution control administration since 1950 are described for Suita City, Japan. In 1950, Osaka Prefecture, in which Suita City is located, promulgated pollution control regulations concerning noxious gases, precipitated particulates, airborne particulates, waste liquids, noise, and vibrations. In 1962, a municipal office to hear citizen complaints on pollution was established. Other regulations on pollution countermeasures followed. In 1970, municipal pollution control monitors (30 citizens, of whom 10 are pharmacists) were selected for 2-year terms to disseminate pollution information to the citizenry by means of lectures, discussion groups, films, and tours and to act as a liaison between citizens and the appropriate agencies during occurrences of photochemical smog. The Pollution Countermeasures Examination Committee was established in 1972 as a consultant body to the mayor. The Municipal Pollution Control Section now consists of twelve members: two overall administrators; one water quality tester; four persons to oversee long-range pollution control planning and implementation; and five persons to oversee day-to- day pollution control and technology problems. Two pollutant monitoring stations and one mobile vehicle are in operation to measure sulfur oxides, airborne particulates, hydrocarbons, oxidants, nitrogen oxides, carbon monoxide, wind direction, wind velocity, temperature, and humidity. Water quality (BOD biological oxygen demand, pH, contamination), noise, and vibration levels are also checked.

1971

54108 **APTIC NO. 78148**

Osaka City Government (Japan)

OSAKA CITY AIR POLLUTION CONTROL CENTER. *(Osaka shi taiki osen kanri senta). Text in Japanese. 12p., March 1971.*

The Environmental Pollution Control Center where all data obtained by air monitoring stations in the area are collected and analyzed as a whole, was established in 1968. The data are transmitted to the center through a telemetering system with telephone circuits for exclusive use. The air monitoring stations located in various parts of the city are divided into the following three groups by function: (1) air monitoring stations for the observation of sulfur dioxide, airborne particulates, oxidants and other pollutants in the city, and of wind direction and velocity; (2) automobile exhaust monitoring stations for the measurement of automotive exhausts such as carbon monoxide, nitric oxide, nitrogen dioxide, and hydrocarbons; (3) Osaka Tower and Tsutenkaku Tower monitoring stations for the observation of air pollution conditions at high altitudes, as well as the meteorological conditions.

SOCIAL ASPECTS

1975

54109 **APTIC NO. 77964**

Humphrey, Craig R. and John A. Krout

TRAFFIC AND THE SUBURBAN HIGHWAY NEIGHBOR. *Preprint, Pennsylvania State Univ., College Park, 31p., 1975. 20 refs.*

Data on residents reactions to nearby limited access highways were collected from surveys of homeowners in four suburbs in the eastern United States. Sound recording equipment and instruments for measuring air quality were used to insure that control areas where highway disturbances are not obvious were included in each study site. Questions dealt with the demographic characteristics of residents, the features of their homes, perceptions of indoor and outdoor noise, odors, and dirt, their use of the highway, outdoor recreational activities on their own property, neighborhood social interaction, and satisfaction with one's home and neighborhood. Noise was the main disturbance noticed. Dust on windowsills, dirt on the outside of the house, vibrations of objects such as windows or plates in cupboards, and outdoor odors follow respectively in importance for residents. The smell of nitrates and hydrocarbons in automotive exhaust are not noticed often by highway neighbors shielded indoors from these chemicals. Distance from the roadway is important for the level of annoyance. People's attitude about the convenience of travel on the highway is significantly related to annoyance with traffic. Socioeconomic status and length of time lived near the highway are not statistically important. Highway neighbors who think the roadway is adversely affecting their property values are more annoyed with the traffic. Experience with another busy road is not statistically significant. Central air conditioning is negatively associated with annoyance, but the relationship is not statistically significant. Highway neighbors above the road are less annoyed with odors, noise, and dirt from traffic.

54110 **APTIC NO. 78060**

Jaggi, Bikki and George Westacott

THIRD-WORLD MANAGERS ATTITUDES TOWARD POLLUTION. *J. Appl. Psychol., 60(3):392-394, 1975. 11 refs.*

A questionnaire survey of 120 managers in India was conducted to assess their awareness and concern over pollution. Approximately one half of the managers were not aware of pollution problems. Another 30% were aware of pollution but were not concerned. Only 19% of the managers were both aware and concerned regarding industrial pollution. Aware managers whose firms had social goals were much more concerned about pollution than managers whose firms had other goals. Concern over pollution also increased among aware managers as their education increased. There was a direct relationship between the age of a manager and his awareness of pollution; age was also moderately associated with concern. Awareness and concern also increased as the level of management increased. Awareness and concern over pollution in India appears to be substantially less than that for more developed countries.

54111 **APTIC NO. 77869**

Spengler, John D. and F. Peter Fairchild

A COOPERATIVE MULTIUNIVERSITY APPROACH TO AIR POLLUTION TRAINING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-13.2.)*

A cooperative, multiuniversity approach to air pollution training known as the New England Consortium on Environmental Protection is described. The NECEP is an association of 14 colleges and universities participating in a regional environmental program that functions in two major areas: guided research on air quality issues of regional concern and experimental learning through direct student-professional contacts. During 1974-1975, the student research projects dealt with three major issues: the design of an air quality information system for New England, the relationships between energy conservation and air quality management, and the interaction of land use and air quality planning. Over 300 students in the last 3 yr were able to interact with air pollution control agencies, commercial and industrial associations, planning and zoning boards, state legislatures, and public interest groups as a result of the program. (Author abstract modified)

1974

54112 **APTIC NO. 78184**

Yajima, T., T. Azumada, and M. Isomura

AUTOMOBILE TRAFFIC ON LOCAL HIGHWAYS AND THE ENVIRONMENT AROUND THE HIGHWAY (OVERALL EVALUATION OF THE ENVIRONMENT). *(Chiku doro ni okeru jidosha kotsu to endo kankyo (sogoteki kankyo hyoka) ni tsuite). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, vol. 4:280-281, 1974. (Presented at the Japan Society of Civil Engineers, Lecture Meeting, 29th, Tokyo, Japan, 1974.)*

A survey was made to determine how people feel about living near highways.. Of the 23 areas surveyed, an average of 38.9% wanted to move away, and regression analyses showed high correlations with noise, traffic anxieity, exhaust, vibration, and traffic accidents. An average of 21.7% felt their environment was good, 34.6% were indifferent, and 43.7% felt it was bad. If there were sidewalks fewer people wanted to move away. As traffic volume increased, more people wanted to move. Also, as traffic increased, more people evaluated their environment as bad.

1973

54113 **APTIC NO. 78185**

Mitsuboshi, A., K. Yano, and F. Nakaoka

AUTOMOBILE TRAFFIC ON LOCAL HIGHWAYS AND ROAD ENVIRONMENT (TRAFFIC INTERFERENCE, ANXIETY IN TRAFFIC). *(Chiku doro ni okeru jidosha kotsu to endo kankyo (tsuko bogai, kotsu fuan ishiki ni tsuite). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, vol. 4:284-285, 1973. (Presented at the Japan Society of Civil Engineers., Lecture Meeting, 28th, Tokyo, Japan, 1973.)*

Questionnaires were distributed to residents of 23 areas of Osaka, 60-100 households, 150-300 persons per area. The correlation between people's traffic anxiety and the number of accidents was established. However, randomness was great, proving that traffic anxiety cannot be grasped by number or frequency of accidents alone. In all areas, 57% always felt anxiety, while in 32%, sometimes. For all areas, 28% found it considerably difficult to cross the road, 37%, somewhat difficult. Thirty-one percent found that whenever a car came along, they had to stop, one area showing 66% of the people stopping. Fourteen percent in all areas went out less due to increased traffic, one area indicating that 31% went out less.

GENERAL

1975

54114 **APTIC NO. 77860**

Caswell, C. A.

THE DILEMMA OF POLLUTION CONTROL. *Preprint, 40p., July 1973. 57 refs. (Presented at the National Conference on Complete Watereuse: Water s Interface with Energy, Air and Solids, 2nd, May 4-8, 1975.)*

The limitations of pollution control are discussed in terms of the assimilative capacity of the earth s existing physio-chemical systems. The essence of the pollution problem is seen not as the specific material produced or wasted but rather as the rate at which the material is being produced and added to existing systems. Even the cleanest technology produces such wastes as water vapor and heat; yet there is a finite limit to to the capacity of the atmosphere to handle such components without leading to climatic disruptions. Thus, it appears that the human race is going to be faced in the future with the necessity for stabilizing industrial production, i.e., the rate of conversion of matter. (Author abstract modified)

1974

541[illegible] **APTIC NO. 78248**

Caglioti, Vincenzo

FOUNDRIES AND ENVIRONMENTAL ECONOMY. *(La fonderia nell economia ambientale). Text in Italian. Fonderia Ital., no. 10:283-289, 1974. 3 refs.*

There is a growing emphasis on the recycling of natural resources. For example, the reprocessing of scrap iron involves an average saving of 74% of the energy used in ore reduction and an 84% decrease in pollution output. This calls for an approach to manufacturing that will favor the recycling of raw materials used. A publication of the American Foundrymens Society lists 450 substances for which there are maximum permissible limits in the foundry work environment. It has been estimated that in Italy, on the average, about 20% of the cost of a manufacturing plant must not be allocated to pollution abatement equipment. Interdisciplinary communication where engineers can converse with physicists, chemists and environmentalists, and vice versa is discussed. Environmentalism also cannot be considered in isolation from the need to regulate the standard of living and to understand and influence human behavior.

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